JANUARY, 1951

FIVE DOLLARS PER YEAR · FIFTY CENTS PER COPY

Quick Starts
SMOOTH PERFORMANCE
REGARDLESS OF WEATHER WITH
Because winter weather calls for better motor fuel the A.S.T.M. Committee D-2 (Petroleum Products) recently took action approving an increase from 13.5 to 15 lbs. R.V.P. in the maximum vapor pressure for gasoline marketed in the northern states. Meet this need now by blending with WARREN'S Stabilized Natural Gasoline and Butane. WARREN'S Greater Volatility and Higher Octane rating mean instant starting, more pep, greater power, smoother acceleration when you need them most.
NATURAL GASOLINE
Butane
Propane
Iso-Butane
Iso-Pentane
Hexane
Heptane
STA-VOL-ENE
Stabilized

WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

These two views show a 118-ft. diam. tank equipped with a Horton Double-Deck Floating Roof at Imperial Chemical Industries, Ltd., Wilton, Yorkshire. The one above illustrates how the roof floats directly on the liquid. Both the tank and roof were built by our licensee, Whessoe, Ltd., of Darlington, England.

a Clue...

to undiscovered savings in your working tanks

YOU'RE a spendthrift if you use a fixed-roof tank for working storage of volatile liquids like gasoline and crude oil. Every time you fill that fixed-roof tank, the incoming liquid forces gasoline or crude oil vapors out through the vents. These escaping vapors are an "undiscovered saving" that you can't afford to overlook any more.

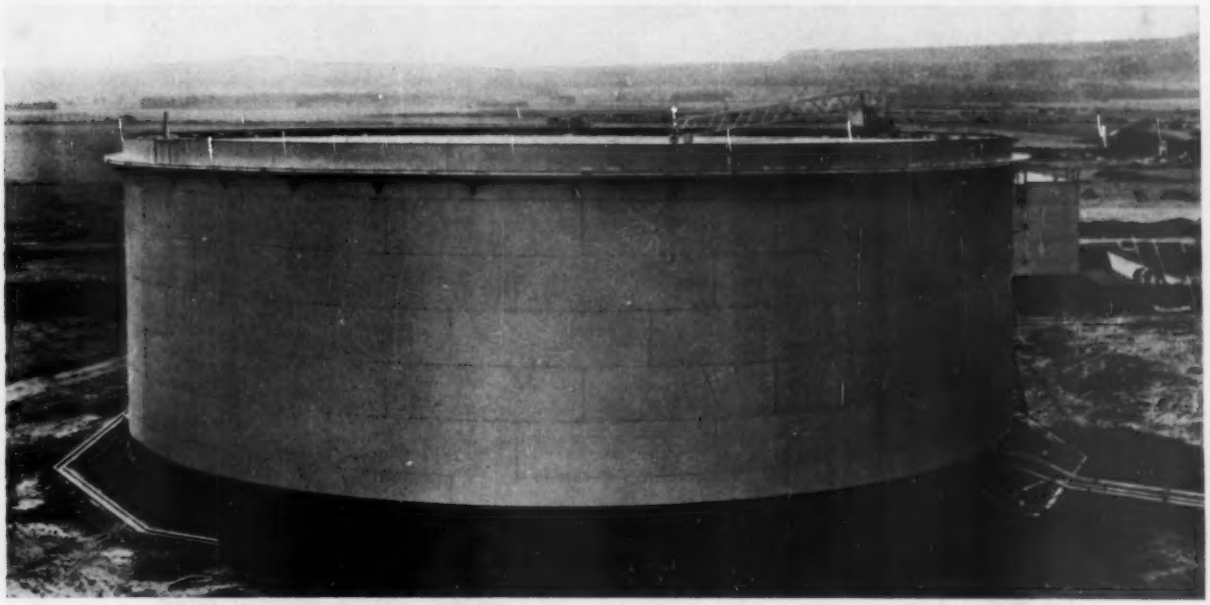
The view at the left is your clue. It shows a HORTON DOUBLE-DECK FLOATING ROOF. This roof stops filling evaporation losses because (1) it floats directly on the liquid and thereby eliminates the air-vapor mixture that is present in a fixed-roof tank and (2) it is equipped with the Horton seal, the best device ever invented for preventing the escape of vapor around the edge of a floating roof.

By stopping filling losses with a HORTON DOUBLE-DECK FLOATING ROOF, you obviously protect the quantity of the liquid in the tank. Its quality is protected too for the valuable light fractions are the ones most likely to escape if filling losses occur.

Stop losing—and start saving—gasoline and crude oil vapors by equipping your working tanks with HORTON DOUBLE-DECK FLOATING ROOFS. Bulletin B will show you how these roofs will pay for themselves in a short time. Write the nearest office for a copy.

• • • • •

In addition to stopping filling evaporation losses, the HORTON DOUBLE-DECK FLOATING ROOF . . . reduces standing storage losses . . . has an air-space between the decks to provide the insulation that cuts down boiling losses . . . reduces the fire hazard . . . decreases corrosion on the underside of the roof and on the inside of the tank shell and bottom. Write for Bulletin B.



CHICAGO BRIDGE & IRON COMPANY

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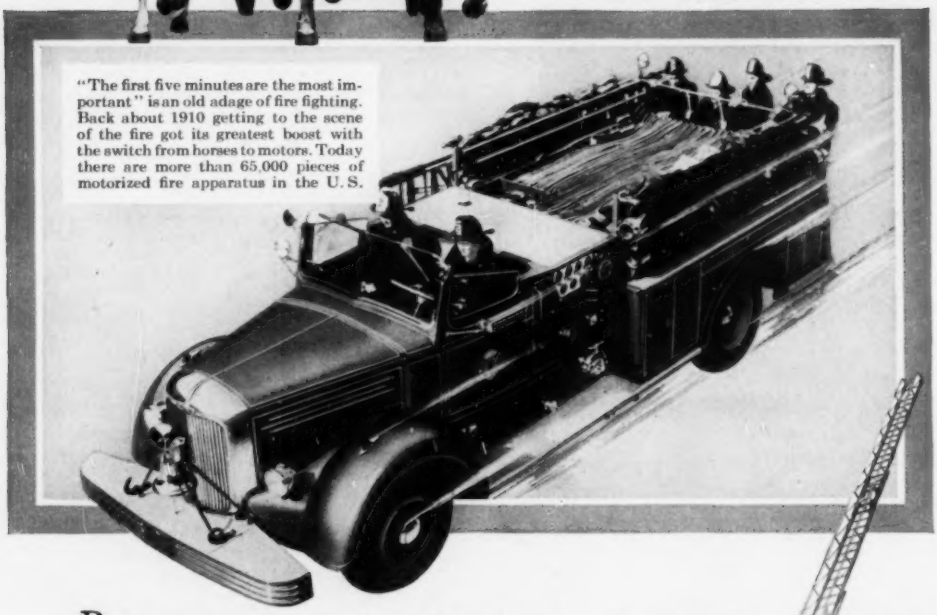
The Horses are under the Hood!

Petroleum Progress Helps Curb Huge Fire Losses



"The first five minutes are the most important" is an old adage of fire fighting. Back about 1910 getting to the scene of the fire got its greatest boost with the switch from horses to motors. Today there are more than 65,000 pieces of motorized fire apparatus in the U. S.

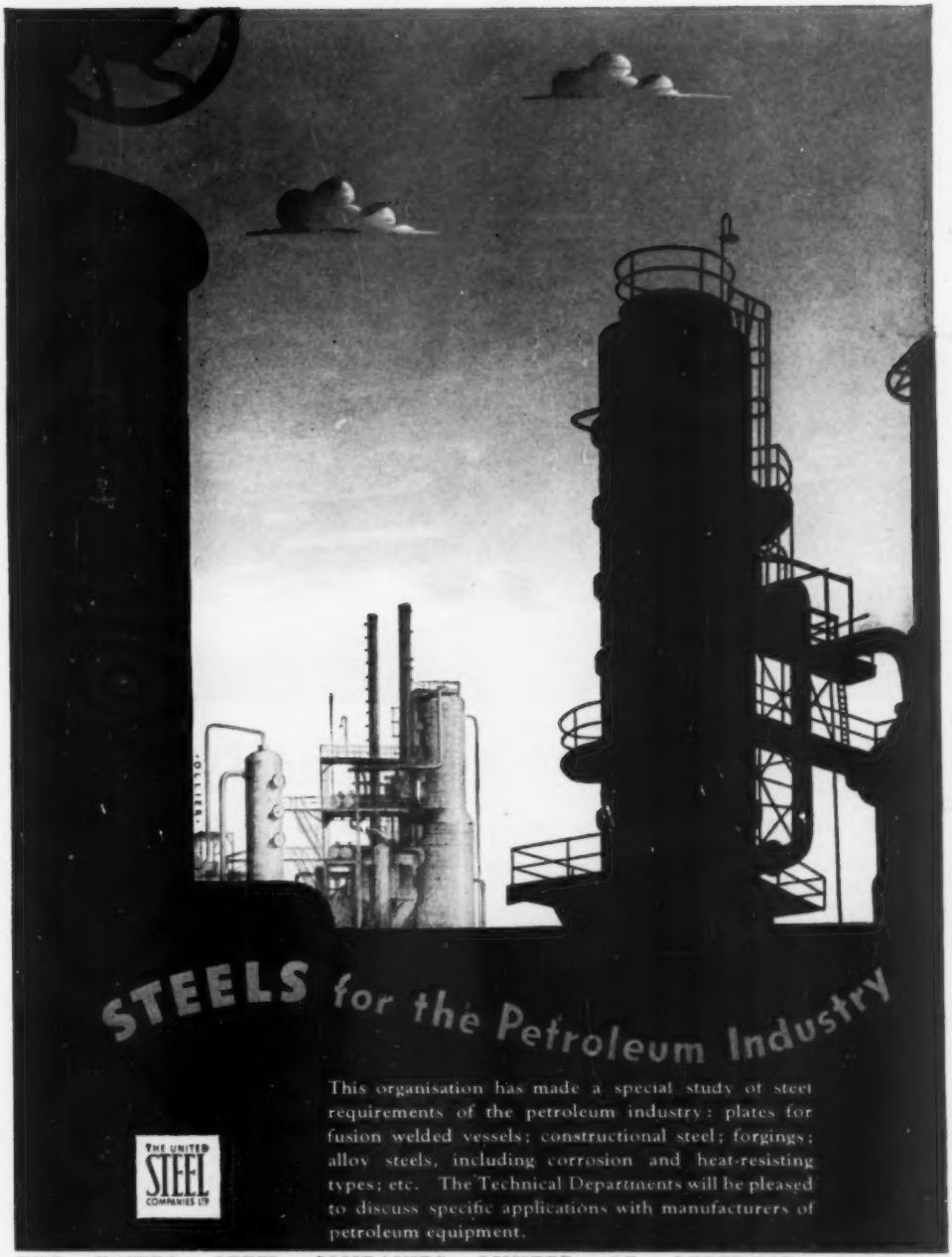
PETROLEUM research stepped up the pace and efficiency of America's fire fighters—with the changeover to highly mechanized apparatus and equipment. Today the most remote townships have manpower, motor power, ready and waiting. Texaco lubricants and fuels supply many of the 15,000 U. S. fire departments. Here is another instance of the development, the research and the resources of petroleum, put to good use — in this case to save lives and conserve property.

The word FIRE can turn out more than a million men — organized, trained and equipped to fight fire. 750,000 of these are volunteers— the backbone of our vital fire-control system. We can be proud of them — and proud, too, of the part petroleum plays in supplying them modern fire "weapons."

TEXACO

THE TEXAS COMPANY

Petroleum Promotes Progress


STEELS for the Petroleum Industry
This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc. The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.
THE UNITED STEEL COMPANIES LTD
THE UNITED STEEL COMPANIES LIMITED OF SHEFFIELD ENGLAND
THE LARGEST STEEL PRODUCERS IN THE BRITISH COMMONWEALTH

US 37

WORLD PETROLEUM for January, 1951. Vol. 22, No. 1, January, 1951. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 West 45th St., New York 19, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies 50c.

Why the sea is salty

IN Norse mythology, a poor man got a magic mill from the elves. With it he could grind whatever he wanted--food, clothing, furniture, and best of all, gold. Of course, the poor peasant's lot changed from poverty to riches.

An envious brother borrowed the mill. He commanded it to "grind herrings and broth and grind them good and fast." But having taken the mill in such haste, he didn't know the magic words to shut it off. He was almost drowned in broth when the brother came to the rescue.

Finally, the magic mill was stolen by a salt dealer, who put it on his ship. Safely at sea, the skipper demanded, "Grind salt and grind it good and fast." Alas, he hadn't learned the control words either. The mill ground salt endlessly, filling all his kegs and his hold, covering the decks and at last sinking the ship. There at the bottom of the sea, so people say, the magic mill still grinds--and that's why the sea is salty.

From time immemorial, men have dreamed about magic mills and schemes to bring abundance and riches. Here in America, today, there are plans that are flooding us with superabundance of certain commodities. But what about the magic words to shut off the mill?

Isn't it time we see the truth in this ancient Norse myth, that "too much" is just as foolish as "too little?" We may well remember this first law of economics: In a *free* market, supply can adjust itself to demand--whether it be potatoes or steel--without sinking the ship. Here is a must job for all thinking Americans.

QUALITY YOUNGSTOWN SERVICE

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
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MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

Which one of 23 high temperature tube steels do you need? Ask the experts!

AMONG the 23 high temperature tube steels produced by Timken®, there is *one* and only *one* which can solve your heat, pressure, corrosion, and oxidation problems and give you the *best* life/cost ratio, too. And metallurgists of the Timken Company can help you pick it.

These metallurgists are recognized authorities in high temperature steels—have 21 years of experience and research behind them. With 23 analyses to choose from they can recommend the one best tube for your job. And whichever tube you use, you can be sure of uniform quality; Timken closely controls quality from melt shop through final inspection.

Let Timken's "RSQ"—Research, Supply, Quality—solve your high temperature tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

This month Timken reports on:

SICROMO 2½

Suitable for applications in which corrosion resistance is a major consideration, but where conditions do not warrant use of higher-price 4-6 Cr.-Mo. steel. Stability, strength, and oxidation resistance compare favorably with 4-6 Cr.-Mo. Recommended for cracking furnace tubes, heat exchangers, superheater tubes, vapor and hot oil lines.

ONE OF 23 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	16-13-3°
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20°
DM-2	2¼% Cr.-1% Mo.	Sicromo 7	25-12°
Silmo	Sicromo 3	Sicromo 9M	35-15°
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6°
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

°*Available as seamless tubing on an experimental basis only.*

Photo shows metallurgist at Timken determining the lattice structural characteristics of an alloy with X-ray diffraction equipment. Research like this is a big reason for Timken's leadership in high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing

Every Engineer...

Every engineer who is concerned with the pumping of fluids or gases should possess a copy of this Gland Service Recommendation Chart. Over 150 fluids and gases are listed, and appropriate gland packings are indicated on the accompanying charts.

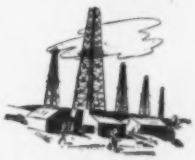
If you have not already received a copy, please send your name and address to us and we will forward a copy to you.

Crane Packing LTD OF SLOUGH ENGLAND
A COMPANY

Electrical Apparatus
FOR EVERY INDUSTRY

electrification

INCREASES YOUR PRODUCTION!
CUTS YOUR COSTS!

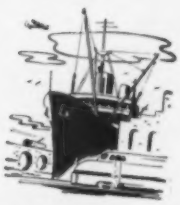


DRILLING

Drill more wells faster with electrified rigs which offer you advantages not found in any other type of oil-field power. Remember that electric motors are simple, electric controls precise—a bit on the end of a 3-mile string of pipe can be delicately controlled at 1 rpm or at top speed. Send for GEA-4456, GEA-3858 and GET-1360.

PUMPING

Pump more oil automatically with units modernized with efficient electric power. Let our application engineers help you in selecting the motors and control to fit your specific requirements. Whether the well is being pumped slowly for long periods, fast for short periods or round-the-clock service, G.E. dripproof motors ask no quarter due to severe operating conditions. The G.E. Oil Well Pumping Control will save you many man-hours in labor and supervision.

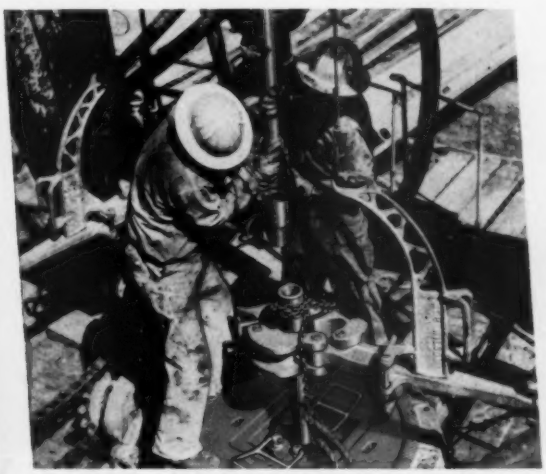


PIPELINES

We will continue to engineer the best system for you to move oil efficiently through gathering, branch and trunk pipe lines. Write for our new publication, entitled "G-E Equipment for Electrified Oil Pipelines."

REFINING

Because it best combines simplicity, security, and savings, today's trend is toward greater use of explosion-proof, corrosion-resisting motors and group installation of control centers. To protect continuity of service at minimum cost, use secondary selective distribution systems with unit substations. For full information on motors and control for hazardous areas, send for GEA-4131.



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GENERAL ELECTRIC

THERE IS NO TIME LIKE THE ~~PRESENT~~ *future*

We believe the long-sought-after "Fountain of Youth" can be found right in the Refining Industry itself.

In no other industry do you live quite as much in the *future. Every* day is devoted to anticipating "tomorrow." This is the challenge that keeps us young—*at fifty.*

Here are the highlights of our immediate future in the "present indicative":

—*Ten more Fluid catalytic crackers*
. . . including new Orthoflow models

— *Seven complete refineries*
. . . either entirely new or complete renovations

— *The catalytic cracker with the world's largest throughput*

— *The world's largest olefin cracking plant*
. . . for petro-chemical use

— *The world's largest vacuum distillation unit*

All these . . . now in work for sixteen of the world's refiners . . . in the United States . . . Canada . . . Britain . . . Belgium . . . France . . . Argentina . . . Brazil. These are a measure of the recognition we enjoy for our *first* fifty years of service. But like the Refining Industry itself . . . our eyes are focused on "tomorrow."

FOR FIFTY YEARS . . .

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN INCORPORATED

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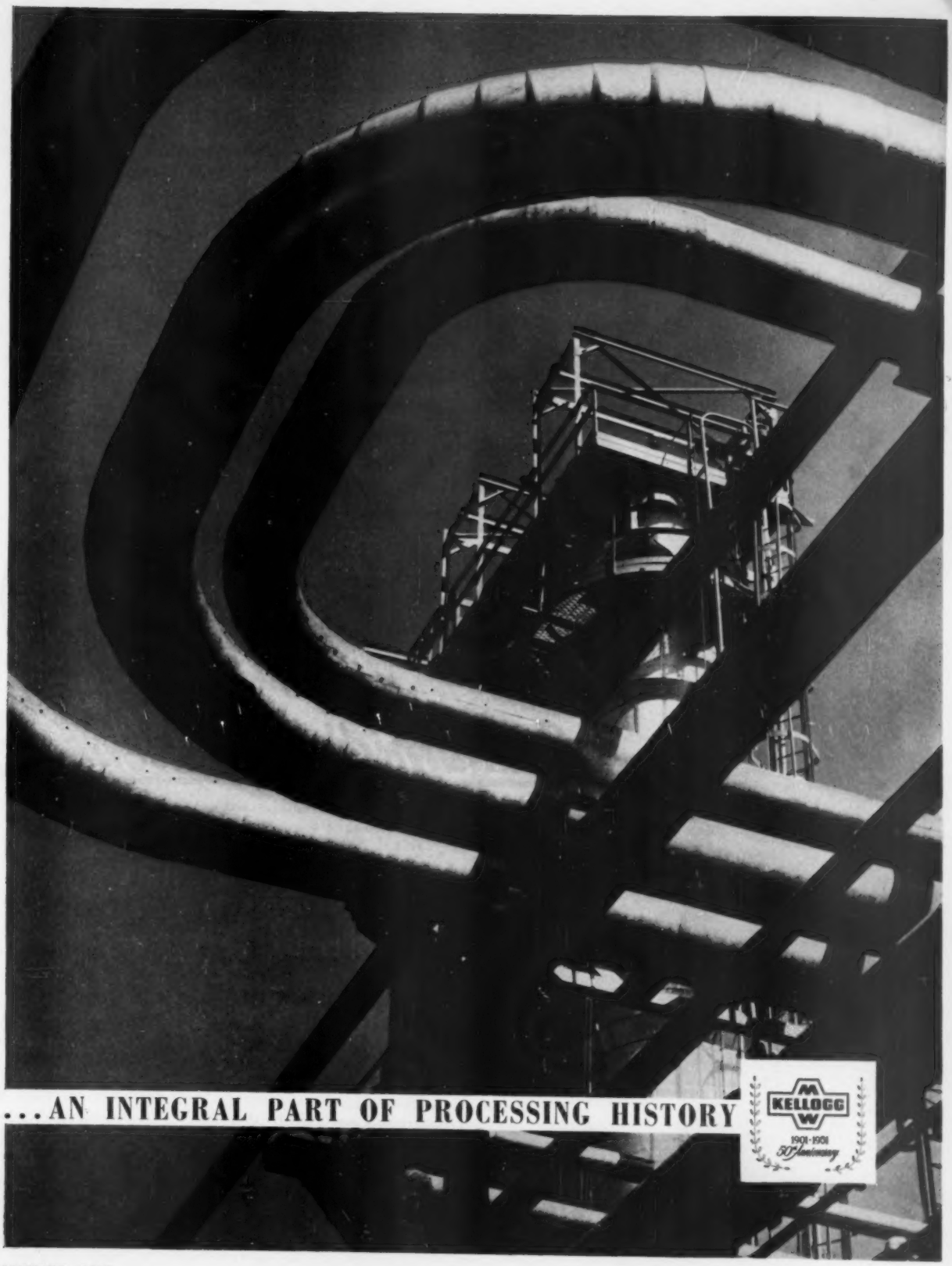
...AN INTEGRAL PART OF PROCESSING HISTORY
KELLOGG
1901-1951
50th Anniversary

Cyanamid's Experience . . .

The story of Cyanamid's progress in the production of synthetic fluid cracking catalysts boils down to these two simple facts:

1. To produce effective catalysts, experience is a must.

2. Cyanamid—one of the first companies to start catalyst production—has that experience.

For nearly a decade, Cyanamid's extensive research facilities, modern equipment, and highly trained technical staffs have all played important roles in producing more effective catalysts. Through these years, Cyanamid has steadily expanded to meet the increased needs of the petroleum industry. Here are some highlights from the record:

1942 . . . Cyanamid starts production of AEROCAT® Synthetic Fluid Cracking Catalysts at Fort Worth, Texas, to help refiners increase their output of high octane fuel.

1946 . . . Cyanamid expands at Fort Worth . . . becomes the *first* to manufacture MS cracking catalyst on a commercial scale.

1948 . . . Anticipating greater demand, Cyanamid increases production of MS cracking catalyst at Fort Worth.

and today, in 1951 . . . Cyanamid builds a new plant at Michigan City, Indiana, to greatly increase the supply of AEROCAT Microspheroidal Synthetic Fluid Cracking Catalysts. This plant will serve the East, Middle-West, and Canada. It will be in production this summer—watch for it!

Clocks Catalyst Progress

Vision, Experience, Facilities, Service . . . is the combination that enables Cyanamid to produce better chemicals for the petroleum industry: AEROLUBE® Additives for motor oils . . . AERO* Specialty Catalysts for chemical processes . . . Gasoline Dyes and Drilling Mud Chemicals. To learn more about these products and how they can help you . . .

send today for samples and literature.

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Catalyst
When ∧ Performance Counts . . .
Call on Cyanamid

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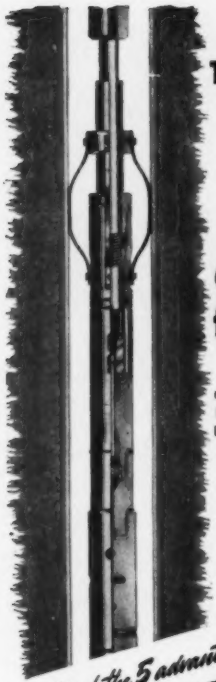
Progress through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland



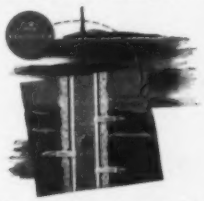
The JOHNSTON SHOOT-N-TEST GUN PERFORATOR

Combines 5 Outstanding Features

for better gun perforating operation!

By selecting a Johnston Gun Perforator you get years-ahead Gun Perforator design for an easier, more economical method of perforating casing. In addition, this Gun Perforator serves as the perforating unit in combined "Shoot-n-Test" operations for the slickest possible way of obtaining water shut-off information, doing exploratory work or testing for actual production.

Check the 5 advantages check and then compare before you buy any Gun Perforator equipment!

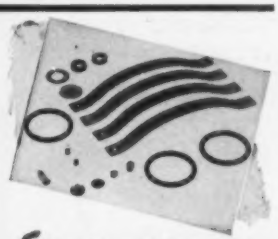


1 Safer Operating . . . because the Johnston Gun Perforator fires only when subjected to *both* in-the-hole hydrostatic pressure and definite top-hole pipe manipulation. You get safety in transporting and rig-floor handling and positive protection against premature firing on the run-in.

2 More Exact Positioning . . . because the Johnston Gun Perforator is tallied in on your own tubing or drill string — no guess work, no elaborate measuring devices . . . you connect the Gun Perforator on the bottom joint of pipe and run-in until actual pipe-in-the-hole tally spots unit opposite the formation to be perforated.

3 Simultaneous Fire of ALL Projectiles . . . because of the hydrostatic firing principle of the firing head and flush hole design of each perforating gun section, the firing of all chambers is virtually instantaneous and all projectiles are projected simultaneously . . . an important feature because *balanced* recoil increases penetration depth and assures proper spacing of perforations.

4 Field Car Portability . . . because the firing head, together with the number of perforating gun body sections selected for any particular perforating job can be easily transported in the back of a regular pick-up truck or field car. *After* arriving at the well location, the Gun Perforator can be assembled with standard hand tools.



5 Faster, Easier Maintenance . . . because of the minimum number of working parts in the firing head and the *few* expendable supplies required after each job. All expended supplies are easily replaced during normal reassembly after cleaning and drying the firing head and perforating gun sections.

WRITE today for descriptive literature!

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION

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TALKING OF PIPES

from "The Pipe Book"
by Alfred Dunhill

BUAKA PIPE

It is in the huge primeval region of African forests, stretching from the Gulf of Guinea right across the Congo Basin to the Great Lakes that the most elaborate and interesting varieties of wooden pipes are made. One such remarkable pipe, which is quite large, is illustrated here from the Buaka country.

INDUSTRIAL PIPING AND ITS HEAT INSULATION

Rather less unusual, but considerably more important, is piping for industrial purposes. Pipes conveying any form of heated fluid require insulating to ensure maximum efficiency. Have a survey made by a KENYON engineer; he will show you the advantages of KENYON planned heat insulation.

KENYON service is available anywhere in the world.

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136 LIBERTY STREET, NEW YORK, 6, N.Y.
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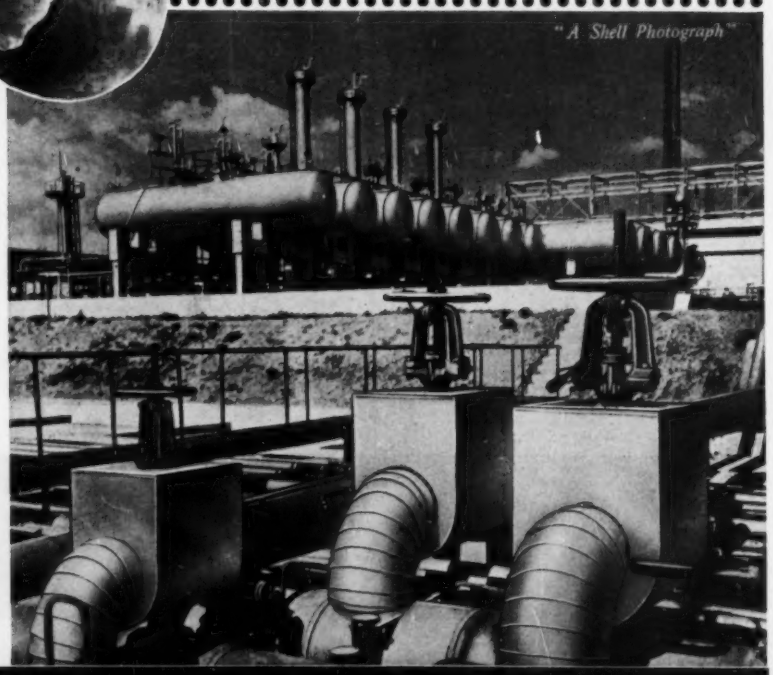
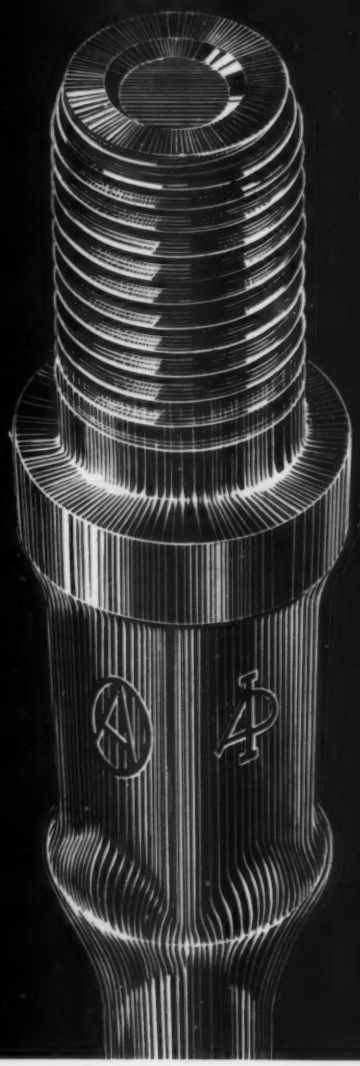


KENYON *Planned* HEAT INSULATION

KH104

XELSON

AXELSON FIRST CHOICE FOR PETROLEUM PUMPING EQUIPMENT



UNQUESTIONED

RELIABILITY

AND ASSURED

PERFORMANCE

For nearly 60 years Axelson has consistently applied performance-proved manufacturing *know-how* to oil field pumping problems . . . that's why experienced petroleum producers specify Axelson Sucker Rods as *First Choice* for any well condition.

ASK AN AXELSON EXPERT

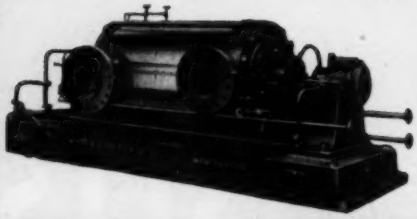
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

AXELSON MANUFACTURING CO. • PLANTS—Los Angeles 58; St. Louis 16 • OFFICES—New York City 7; Tulsa 1; Buenos Aires, Argentina; Caracas, Venezuela • DISTRIBUTORS—Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B.W.I.; Industrias Waldrop & Campbell, Barcelona & Maracaibo, Venezuela; Dominion Oil Field Supply Co., Ltd., Calgary, Canada; South American Supply Co., Avenida Tacna 592, Lima, Peru

Centrifugal Pumps & FLAMEPROOF MOTORS

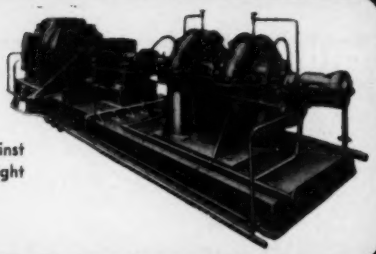
Main Pipeline Pumps....



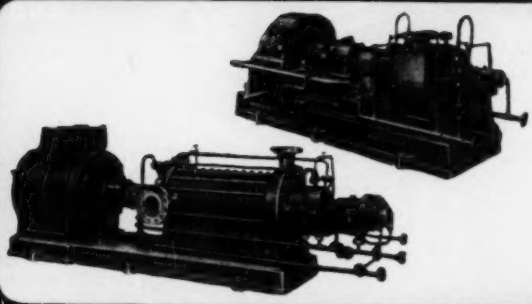
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps

Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.



Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.

MATHER & PLATT

LIMITED

PARK WORKS · MANCHESTER, 10 · ENGLAND

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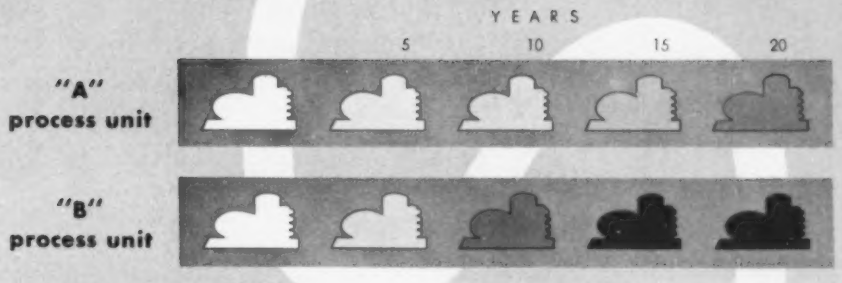

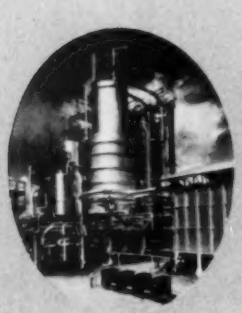

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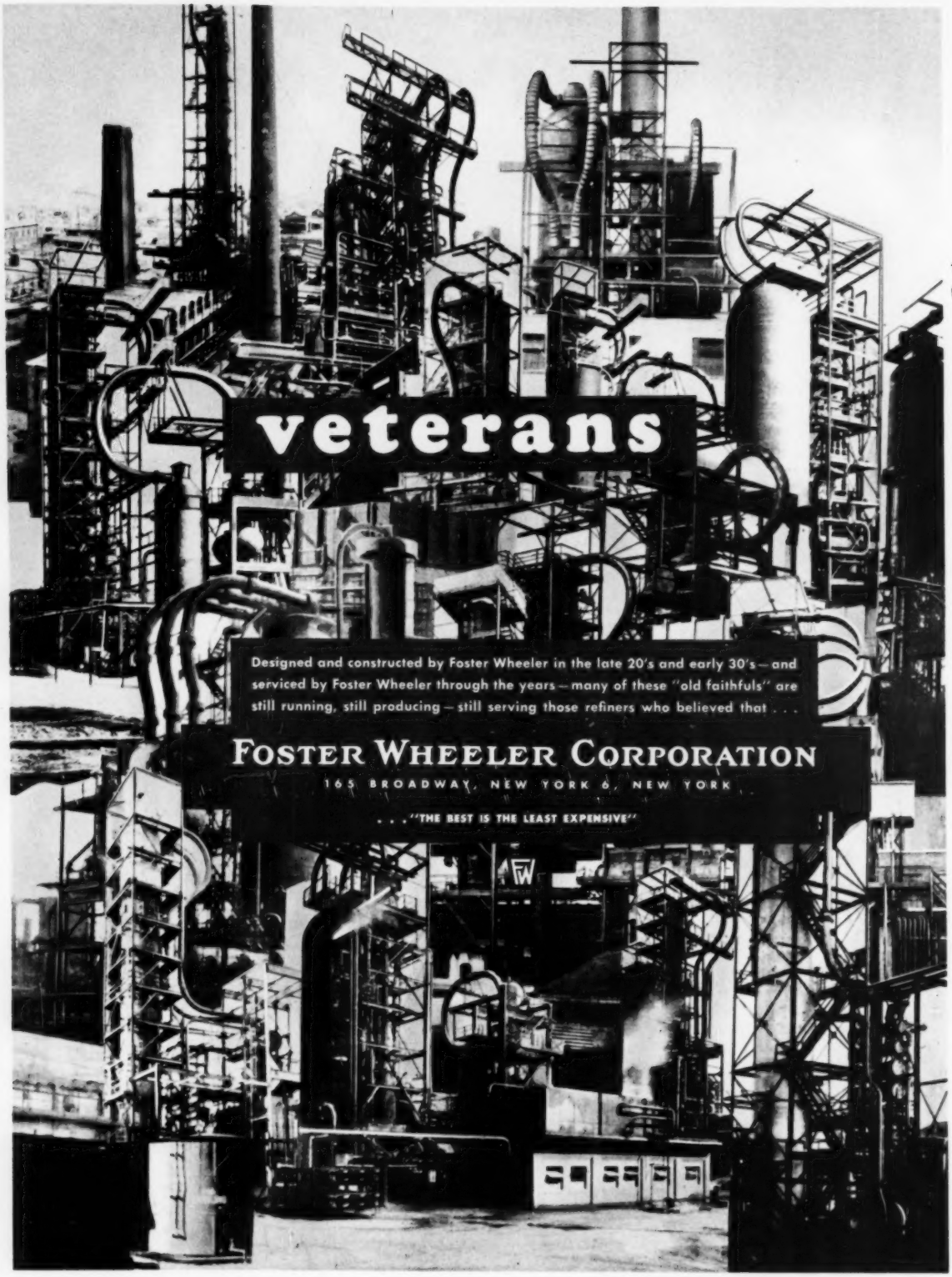
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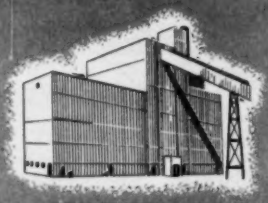

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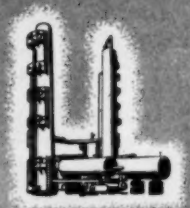

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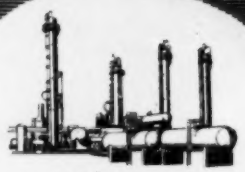

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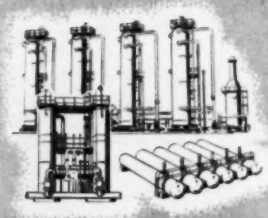

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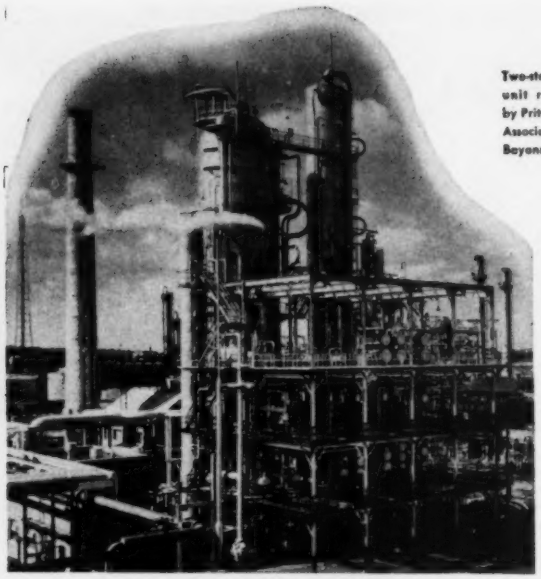

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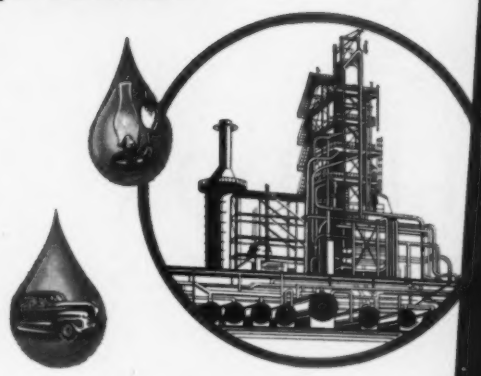

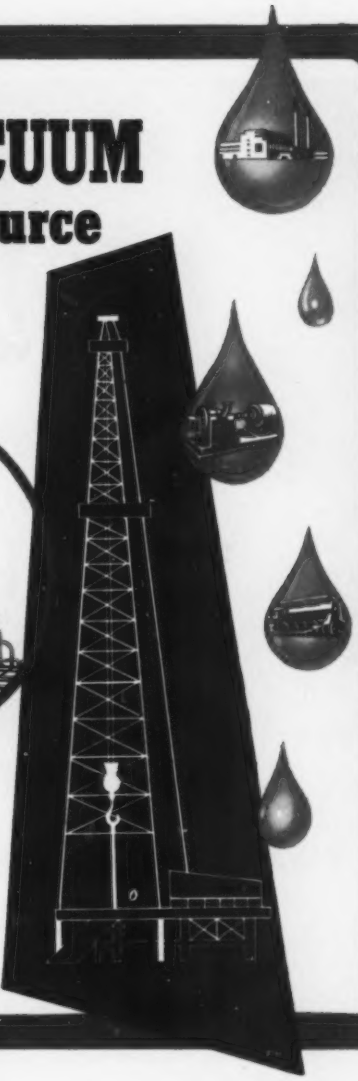

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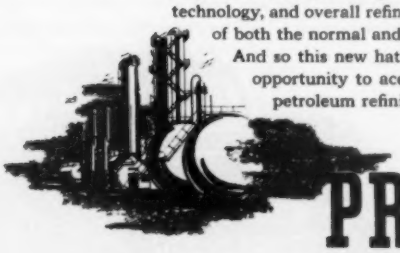

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THIS MONTH'S COVER

The largest tires in the world are used by Arabian American Oil Co. for moving heavy equipment across the desert. The tires pictured are nine and a half feet in diameter and are capable of carrying loads up to 85,000 pounds apiece when inflated to 35 psi. The photograph was taken by Tom W. Walters, public relations photographer for Aramco, at the request of Jack Burke, sales engineer for Pittsburgh Plate Glass Co., who is seen at the right conversing with a friend he happened to run across in the desert, 6,000 miles from home.

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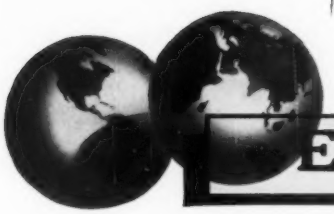


Editorial

Mid-East Oil Converging On New Distributing Center

OPENING to traffic of the Trans Arabian Pipe Line, more familiarly known to oil men as Tapline, which took place early last month, must be set down as marking an important milestone in the development of petroleum transportation. Its construction ranks as a top engineering achievement though the hardy pipeliners who are conditioned to carrying their steel ducts over mountains and through swamp jungles as well as across deserts modestly describe it as just another job. Like most projects of major dimension it embodies engineering and mechanical advances but hardly anything that can be described as revolutionary from that angle.

In its economic aspect as affecting international oil trade, however, the completion of this great line has a special significance as leading the way to creation in the Eastern Hemisphere of a great distributing center which appears destined in the relatively near future to become comparable in importance to the position long held by the Gulf Coast of the United States in the Western Hemisphere.

Movement of oil through the thousand mile pipe from the Persian Gulf side of the Arabian peninsula to Sidon on the Mediterranean eliminates a 3,500-mile water trip and effects a full week's saving in time of transit to European markets. It also avoids the payment of a toll of 18 cents per ton for passage through the Suez Canal. These are advantages which overbalance the heavy cost of building and operating the pipe line system and are leading other companies located in the Middle East to provide similar facilities for the movement of their output.

Sixteen years have elapsed since the Iraq Petroleum Company ran its bifurcated line from the Kirkuk field, which had no water outlet, to Haifa and Tripoli. That system with its 12-inch lines had an original capacity of 80,000 barrels daily and until its recent enlargement this was the only oil delivered at the eastern end of the Mediterranean. Now a new and larger section of the Iraq line is being built employing 30-inch pipe which will raise capacity to 500,000 barrels daily by the end of 1952. Two other lines designed to connect mid-eastern fields with the Mediterranean are now in the blue print stage and ready for construction as soon as materials are available. Tapline itself will be limited for the near future to 300,000 barrels daily but is scheduled ultimately to handle 500,000. From present indications therefore it appears probable that within a relatively few years a total of two million barrels daily will become available at eastern ports of the Mediterranean.

There has been much discussion as to the possible effect which this prospective massing of supply may have upon the movement of oil in international trade, upon the future of Western Hemisphere exports and upon the price structure heretofore in effect. The question has been raised whether the oil of North and South America will lose its overseas markets, whether Gulf Coast quotations will cease to be the primary factor in determining world prices and whether there is danger that western markets will be inundated by imports of ever growing size from the vast reserves of the East.

Analysis of present conditions and trends indicates that there is small likelihood of the serious dislocation of international oil trade by the rising output of the Middle East and the establishment of a new center for its distribution. First of all it must be borne in mind that the world demand for petroleum products is growing at an accelerating rate, that oil has become such a fundamental factor in all industrial progress that this growth is bound to continue and that the most pressing problem before the oil industry as a whole is one of finding adequate sources of crude supply and providing the facilities needed for its transportation and its processing into the products required to satisfy swiftly mounting consumption. Time was when the discovery of a great flush field might lead to the temporary flooding of markets but experience fortified by technological studies has demonstrated the wastefulness of draining reservoirs of their quickly recoverable contents in the shortest possible time and the world's most prolific fields are now being produced at rates scientifically calculated to assure maximum ultimate recovery. Under these conditions figures of potential yield are no longer frightening; the finding of new reserves means assurance for the future, not market demoralization.

Concentration of Middle East oil on the shore of Asia Minor through the construction of pipe lines undoubtedly will increase the movement of that oil to markets of the Mediterranean countries and Western Europe and will permit it to supply a larger part of the expanding refining capacity of the European continent. At the same time the rapidly growing requirements of the United States and the whole Western Hemisphere will increasingly absorb the available output of that half of the world. These are changes that have long been anticipated but the interchange of products across seas will still be necessary and will continue. The net effect of expanding pipe line capacity in the East, as of every improvement introduced into the industry, will be to increase its efficiency and thereby encourage the growth of demand for its products.

TAPLINE Completed

Four tankers line up at loading berths offshore at Sidon to load first cargoes of oil through tapline. Photo courtesy Trans-Arabian Pipe Line Co.

ON December 2, 1950 the tanker Sunset was loaded with 112,000 barrels of Saudi Arabian crude at the new oil port near Sidon, Lebanon, and , sailed for Pernis, Holland, where it will be processed for the growing oil needs of Europe's industry and transport. The cargo was discharged at the Caltex refinery at Pernis on December 13, just 11 days later. The last previous cargo of Saudi Arabian crude unloaded at Pernis had required a voyage of 3,500 miles down the Persian Gulf, to the Indian Ocean, up the Red Sea to Suez where an 18 cent-per-barrel canal toll had been paid before the vessel could enter the Mediterranean.

Between the two voyages Saudi Arabian crude had been moved ten days and 3,500 miles closer to market. The cost of transportation had been reduced. Some 65 tankers of T2 capacity had been released to carry on international oil trade in other areas. European recovery had been facilitated by assuring more adequate supplies at a lower cost.

In the immediate future European crude buyers will receive Saudi Arabian crude at up to 74 cents per barrel less than the cost of this same oil delivered entirely by tanker from the same fields. The sellers of crude at Sidon are Standard Oil Co. (N.J.), Socony-Vacuum Oil Co. Inc., and California-Texas Oil Co. Jersey and Socony have been quoting 36° Saudi Arabia crude at Sidon at the same price they are charging at Tripoli for Iraq crude delivered by pipe line from the Kirkuk field. The price as this is written is $2.41 per barrel. Caltex is also quoting $2.41 at Sidon.

Prior to completion of Tapline the going price for Saudi Arabia crude at Ras Tanura was on the order of $1.75 per barrel, or 66 cents below the Tripoli price. The U.S.M.C. base rate differential between the two supply sources is 70 cents per barrel but current charter rates show differentials on the order of $1.33 to $1.40. On this basis European crude buyers will be paying a net of 67 to 74 cents per barrel below former cost depending on charter rates.

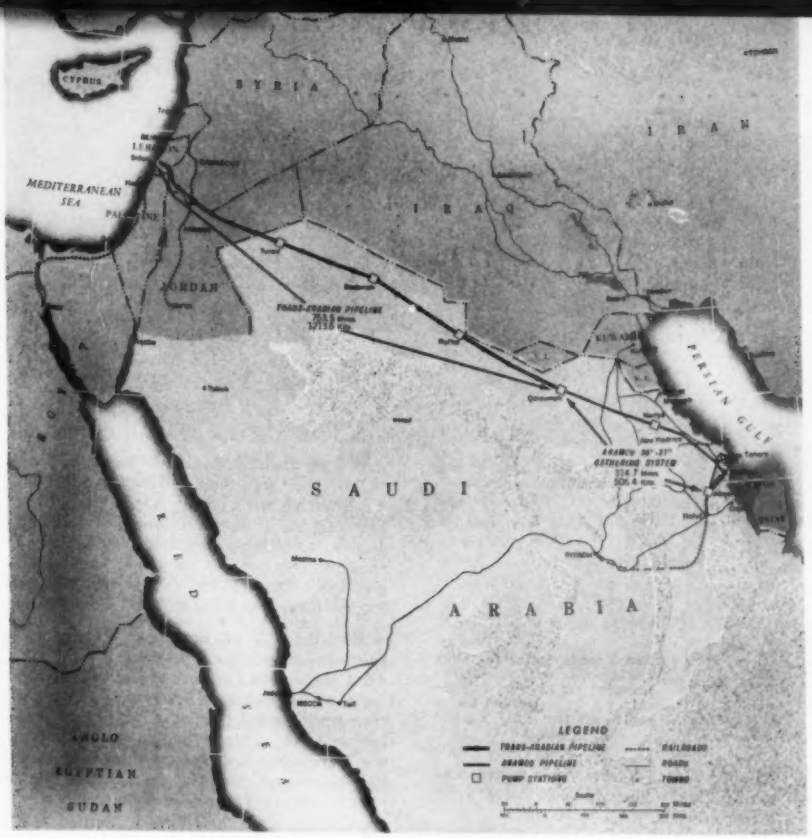
Behind this reduction in space, time and cost lay the expenditure of $230-million on the 1,068-mile Trans-Arabian pipe line and the ingenuity and energy of an army of engineers, artisans and laborers engaged in the intricate three-year job of designing, fabricating and laying the line. Obstacles overcome had included material shortages, political disturbances and a war as well as the formidable job of introducing a complicated modern mechanism weighing 325,000 tons into a waterless, uncharted desert more than 9,000 miles from home. Except for the delay caused by inability to get authority to ship pipe during one 12-month period the line was completed on schedule. Not even a local war on the right-of-way delayed the planned completion date.

Also loaded over the December 3 weekend were the T. S. Petersen, Olympic Laurel and Kentucky. These are 200,000-barrel super tankers. The Sunset is a 115,000-barrel T2. First loadings were made without great fanfare, although W. S. S. Rodgers, chairman of Tapline, and vice presidents B. B. Howard, A. C. Long and F. A. Davies, were present to watch President Burt E. Hull open the control valve to start the first crude flowing.

Final weld in the main line was completed on Sept. 25, 1950, just 32 months and nine days after the first joint was welded. The line was laid at an average speed of about one mile per day. Two months before the final weld the first crude was pumped into the eastern end of the line. Ahead of it was about 200 miles of water piloted by the line scrapers. The scraper pigs were traced on their westward journey by Geiger counters. The pigs carried either radium sulfate or irradiated cobalt capsules obtained from the Atomic Energy Commission.

By the time the first barrel of oil reached the Sidon terminal late in November the 1,068-mile steel tube contained 4,899,500 barrels of crude. To this dead storage must be added another million and a quarter barrels of oil as a minimum working stock at pump stations and terminals. As much oil as the production of Saudi Arabia for 12 days was required to get the line into operation. Total available storage room outside the line itself is 5,747,000 barrels. Tankage at the Sidon terminal for crude and fuel bunkers totals 3,075,000 barrels.

For the first six weeks the line delivered about 130,000 barrels of oil to Sidon each day with only four pump stations. At the end of December the remaining two stations



Map of Tapline system showing location of pump stations.

are scheduled to add their power to the stream and build deliveries to 265,000 barrels daily. The throughput will be increased to about 300,000 BPD in March, 1951. If needed, six more stations will bring capacity to 500,000 barrels daily.

Tapline first was conceived during World War II as a possible means of lightening the load on critically short tankers. A government corporation was chartered to build it and an agreement worked out with Arabian American Oil Co. under which the government would acquire an interest in the Saudi Arabian oil reserves. Political opposition to government ownership of foreign oil was strong enough to kill the plan so it lay dormant until the close of the war when Aramco's owners formed Trans Arabian Pipe Line Co. in July, 1945.

The project still looked too great a financial risk and burden for the two companies which owned Aramco, The Texas Co. and Standard Oil Co. of California. So interests in Aramco and in the pipe line project were sold to Standard Oil Co. (N.J.) and Socony-Vacuum Oil Co. Inc., on Dec. 2, 1948. Socony took a ten percent interest and each of the other companies a 30 percent interest. The new partners provided an immediate supply of new capital totaling $125-million and diluted the risk which is always inherent in a foreign operation where wars or political disturbances may cause loss.

Burt E. Hull, builder of the Big and Little Inch lines during World War II was elected president of Tapline. Mr. Hull had built the first big oil line from Glenn Pool to Port Arthur when Oklahoma became an oil state and had been The Texas Company's expert for 40 years except for the period when he was in government service. As his No. 1 assistant in direct charge of the field construction Mr. Hull selected first H. H. Hall and later Major A. N. Horne as vice president and general manager. Major Horne had worked with him in a similar capacity during the construction of the pioneer large diameter war emergency lines.

Right of way surveys were begun in the summer of 1947. Plan was to follow a direct, great circle route from the Saudi Arabian fields to the Mediterranean coast. There were no roads or previous bench marks from which the surveyors could work. Actually they proceeded as mariners at sea, navigating by the stars across a treeless, trackless waste.

For the first 150 miles the route crosses an arid region partly covered with small bushes and dotted with great 100-foot-high sand dunes, which move southward at the rate of 50-feet per year. The dunes are most frequent in the first 50 miles and elsewhere the level desert provided a good pipe line route.

After the first 100 miles the route to the Jordan frontier slopes gently upward for 750 miles. Only surface features are occasional dry wadis where water may flow or stand for a few hours after one of the few rains which may fall during the period from December 1 to the end of March. Average annual rainfall is only about three inches. Crest of the upward slope near the Saudi Arabian frontier is 2,940 feet above sea level.

Across Jordan the surveyors found an 80-mile stretch covered with hard basalt and lava which is an almost insurmountable obstacle for pedestrians. This was the toughest section of the route for pipe line construction. A vast amount of blasting was required to force the line through.

The advance party surveyed a route for 200 miles across Syria of which some 40 or 50 miles was through cultivated land and the remainder roughly broken with limestone. Near the Syria-Lebanon frontier the route descends a steep escarpment and crosses a number of valleys and the only running streams. In the last four miles the route drops 1,000 feet to the sea.

Although the line was surveyed to the vicinity of Beirut it was much later before the actual western terminus was to be known. Extended negotiation with the three nations to the west of Saudi Arabia was required before pipe could be strung. As a matter of fact building operations were well under way in the east before an outlet had been arranged with Lebanese officials and necessary arrangements concluded elsewhere along the line. Agreements with the nomadic groups are similar to those concluded in earlier years by the builders of the Iraq Petroleum Co. line from Kirkuk to Tripoli.

In Saudi Arabia it was agreed that desert travelers would be provided with free water for themselves and their animals and with free emergency medical attention. When they made this deal Tapline negotiators were unaware of the extent of their commitment. There were, of course, a number of nomadic tribes which pastured their animals on the sparse grass of the central desert during the December-March rainy season and then drove their flocks on to other pastures 300 miles to the north when the grass gave out. It was anticipated that a few travelers might cross the line each year.

A supply of water for the construction project was manifestly necessary because in the 130 degree blaze of the desert sun where the relative humidity averages seven percent a man must drink two gallons of water a day. So drilling crews were brought in, forty wells sunk and pumps and tanks installed. Two miles from each pipe line pump station site a public watering trough was set up to meet the needs of "travelers." The series of wells provided a supply of water at approximate 50-mile intervals across the desert.

No sooner had the first elevated tank been raised above the desert floor and the first watering trough supplied with water than the Tapline officials got a rude shock. It seems that there were a great many "travelers" in

A. N. Horne, Tapline vice president, and S. D. Bechtel, chairman of International Bechtel, Inc., shake hands at the western end of the 854-mile stretch of line constructed by IBI. Photo by Richard Finnie for Bechtel.

the desert roads a magnet truck patrol was set up with good results. Tire costs for vehicles used on the line was on the order of $2-million.

An important element in expediting pipe deliveries to the field and field welding was the adoption of automatic welding of line pipe into 93-foot sections at Ras el Misha'ab. The automatic operation could, of course, be carried on far more expeditiously at the base camp than in the field. Overland transportation costs were cut in half. In the mountainous western section trucking difficulties made it necessary to limit joints to 31 and 62 feet. Most of the pipe was delivered from Ras el Misha'ab, however.

Other special devices developed for pipe handling included a machine for denesting the double lengths of pipe after unloading. In the field the 93-foot lengths of pipe were accurately lined up for hand welding by a special line-up clamp. It was found that little more time was required to line up the 93-foot sections in the field than was needed for either 31- or 62-foot lengths. Lining and stringer-bead welding of sections required about four minutes. More than 100 joints per day have been laid with two tractors handling each joint while lining up and a third setting the pipe on skids.

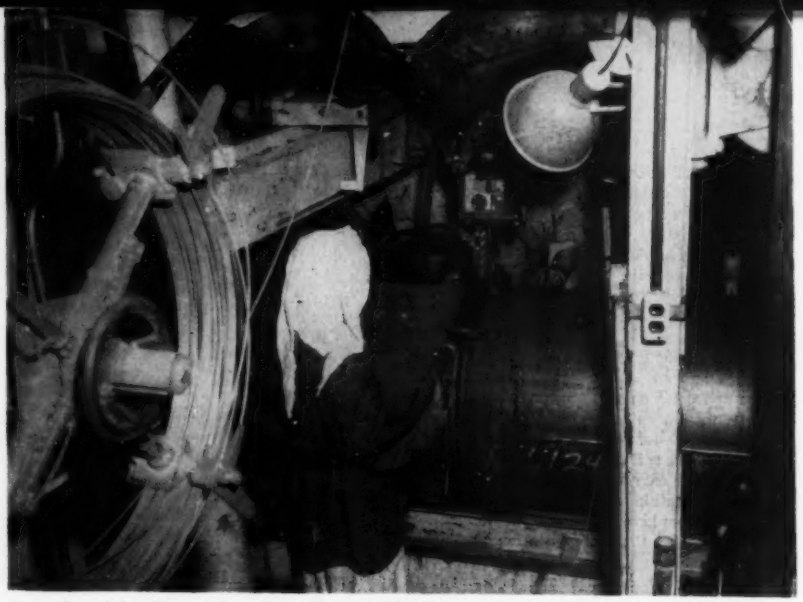
Wall thickness of Tapline pipe is tapered from one quarter to a half inch depending on pressures to be encountered. The 22-inch pipe used at the western end where it descends to the sea and the 24-inch by-pass lines at pump stations have a half-inch wall thickness. The 30 and 31-inch main line pipe was fabricated with one quarter, three eighths, five sixteenths and seven sixteenths wall. In ordinary operation additional pump stations would have been preferable but in the desert a pump station becomes a small town when completed. Taper pattern was based on a final capacity of 500,000 barrels daily and 12 pump stations.

Plate for the pipe was rolled at Geneva, Utah, and fabricated by Consolidated Western Steel Corp. at Maywood, Calif. After longitudinal welding to a diameter a half-inch below specification each length of pipe was cold worked by hydraulic expansion to size. This increased the circumferential yield point to a minimum of 52,000 psi. and an ultimate of 65,000. Both figures were exceeded in practice. The cold working caused an increase of circumferential yield by 12,000 to 20,000 psi and the ultimate by 3,000 to 7,000. After expansion the pipe was hydrostatically tested to 90 percent of 52,000 psi yield point.

Design capacity of the pipe line was taken at 65 percent of the nominal yield. This permits a working pressure of 545 psi on 31" quarter-inch wall thickness pipe and 985 psi on 30" seven-sixteenths-inch pipe.

About 60 percent of Tapline is buried but for 40 percent of its length trenching would have been too expensive so it is supported above ground at 66-foot intervals by concrete pads and pressed-steel ring girders. In eastern Saudi Arabia the line is supported on steel piles across a series of salt marshes known as "sabkhas" which are treacherous for motor transport unless outside material is brought in.

Above-ground construction of the line presented the Tapline engineers with some interesting problems because of the very wide changes in temperature from season to season and between night and day. Vibration in the above-ground line under the stresses created by high winds also was considered in the design.



Circumferential welding of line pipe at Ras el Misha'ab into 93-foot lengths. Assistant operates vacuum cleaner for recovery of flux. Tapline photo.

Maximum line temperature of 140°F. was anticipated with a winter minimum of around 40°F. although air temperatures do fall below freezing in western Arabia. On this basis it was determined not to provide for expansion and contraction, but to hold the line firmly in place with suitable anchorage at changes in direction. Pulling apart and rupture of longitudinal welds have been the most frequent causes of line failures on other big inch lines. Axial stress for a 70° change in temperature on a restrained line was calculated at 14,000 psi which was not considered excessive. In addition it was calculated that internal fluid pressures in the line would tend to counteract the compressive stresses due to rise in temperature.

Since Saudi Arabia crude is somewhat waxy the line was provided with scraper traps. It was anticipated that temperature of the pipe line stream may drop to around 55°F. in winter which would tend to cause accumulations in the line. Also such traps are useful in putting the line into service.

The sections of the line which are buried have been given cathodic protection against corrosion and an asphalt coating followed by fiber glass wrap and a second coat of asphalt. In most sections asbestos felt and special reinforcement have been added.

Where rock was encountered at a distance of two feet below the surface the line was partially buried. At all points where trails cross the line earthen ramps were thrown up to provide an easy crossover for men and animals.

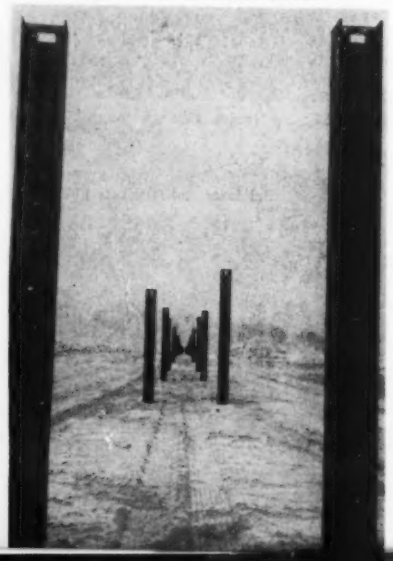
Although the entire 1,068-mile line has been referred to in this article as "Tapline," ownership of the gathering system and the main line as far as the Qaisumah pump and metering station is in the name of the affiliated producing company Arabian American Oil Co. usually referred to as Aramco. Tapline proper thus consists of 753.5 miles of line from Qaisumah to Sidon with the remaining 314.7 miles being considered as Aramco gathering system.

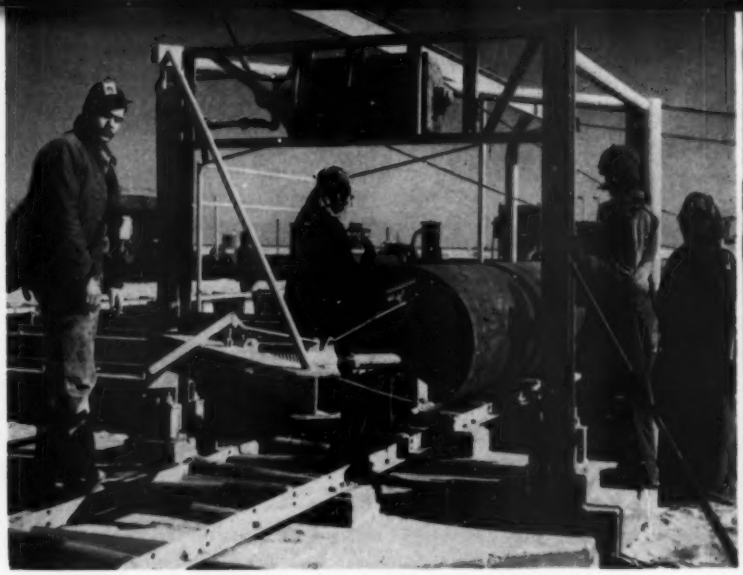
Contracts for construction of the line were divided into two parts. International Bechtel Inc. built the eastern system including the port at Ras el Misha'ab, five pump stations and 854.4 miles of pipe line. Roy C. Middleton was general superintendent of pipe line construction for International Bechtel and Charles E. Barker supervised transportation and road building. J. Roy McAuliffe, Bechtel vice president, was general project manager.

Williams Brothers was contractor for construction of the difficult mountainous western section of 213.8 miles. Williams Brothers also built the Sidon terminal. Jack Burroughs was construction manager for this end of the job; L. D. McCullough, general superintendent and George Allen pipe line construction superintendent.

Tankage at the western end of the line was built by Graver Construction Co. and at the eastern end by Chicago Bridge and Iron Co.

H beam piles in subkha on Abqaiq-Qatif section. Upper portions will be cut off and used as caps to support pipe. In other sections concrete footings were used. Tapline photo.





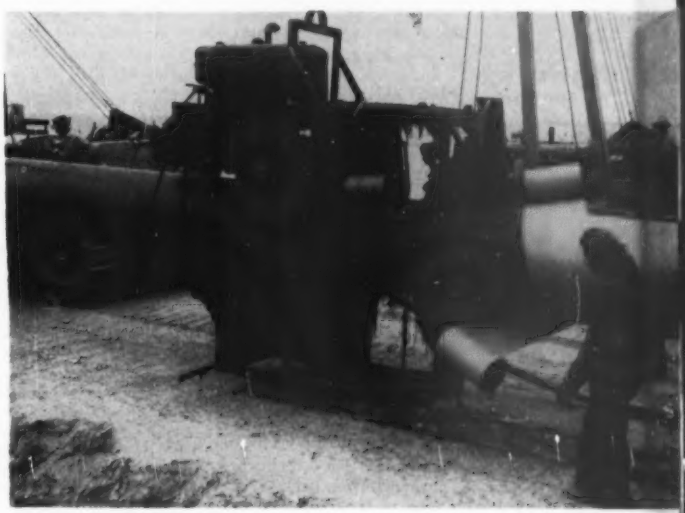
Denesting 30- and 31-inch pipe prior to welding at Ras el Misha'ab.

Automatic internal line-up clamp used to speed-up welding in the field. Bechtel photo.

Chicago Bridge also built special water and fuel tanks at five stations.

Tapline officials and major contractors made it a policy to use local labor as far as possible. In fact Arabs were favored for subcontracts in all operations they would handle. At the peak period 14,559 Arabs were employed as compared with 1,557 Americans both overseas and in the United States. Total man months on the project involved 36,600 Americans and 173,000 nationals.

Arabs were found to be quick learners and efficient workers with mechanical equipment even though the Mohammedan accepts any assignment with the understanding that it will be accomplished only "Inshallah." All operations have ceased between Thursday noon and Saturday morning to observe the Sabbath and fast periods have been slow because it is not permissible to eat or drink between sunrise and sunset. The barrier of language was effectively overcome by signs and a new mongrel tongue began to be heard which was neither Arabic nor English. But it did get the job done.



Wrapping operation in which asphalt-coated pipe is covered with fiber glass and heavy paper. Aramco photo.

Aligning two sections of line prior to welding. Line here is laid on steel supports and held in place with ring girders. Tapline photo.

Lowering length of prepared line into ditch. Bechtel photo.

Tapline Pump Stations And Terminal

Concrete anchors for 30-inch submarine tanker loading lines at Sidon terminal. Blocks weighing five tons per pair are set astride the line to prevent drifting. Except as otherwise noted, all photographs with this article are reproduced through courtesy of the Bechtel Corp. Richard Finnie was the photographer.

PRIOR to the completion of Tapline the equivalent of 65 T2 tankers was required to move 300,000 barrels of oil daily 3,500 miles around the Arabian peninsula. Combined horsepower of such a group of vessels is 429,000.

The entire pipeline employs 41,000 horsepower exerting a combined pressure of 4,500 psi to move the same quantity of oil 1,068 miles across the desert and load it into tankers at Sidon. In addition the line consumes about 13,000 horsepower for production of electrical energy and other auxiliary services.

Calculated fuel consumption of 65 T2 tankers in continuous service is on the order of 19,500 barrels daily. Tapline consumes about 1,300 barrels of fuel in accomplishing the same amount of useful work.

Pump stations for Tapline have been developed as complete communities because of their isolated situations in the desert about 180 miles from the nearest installation. At each of the six stations some 20 Americans and 200 Arabs live within a fenced compound of about 200 acres with most of the amenities of this modern age except tree planted gardens.

A regular "milk-run" plane brings in the mail. Refrigerated trailer trucks deliver fresh fruits and vegetables. Weekly free movies in the recreation hall and short wave radio provide entertainment for both adults and children of pre-school age. Playgrounds keep the children occupied during the day and athletic fields are available for their elders.

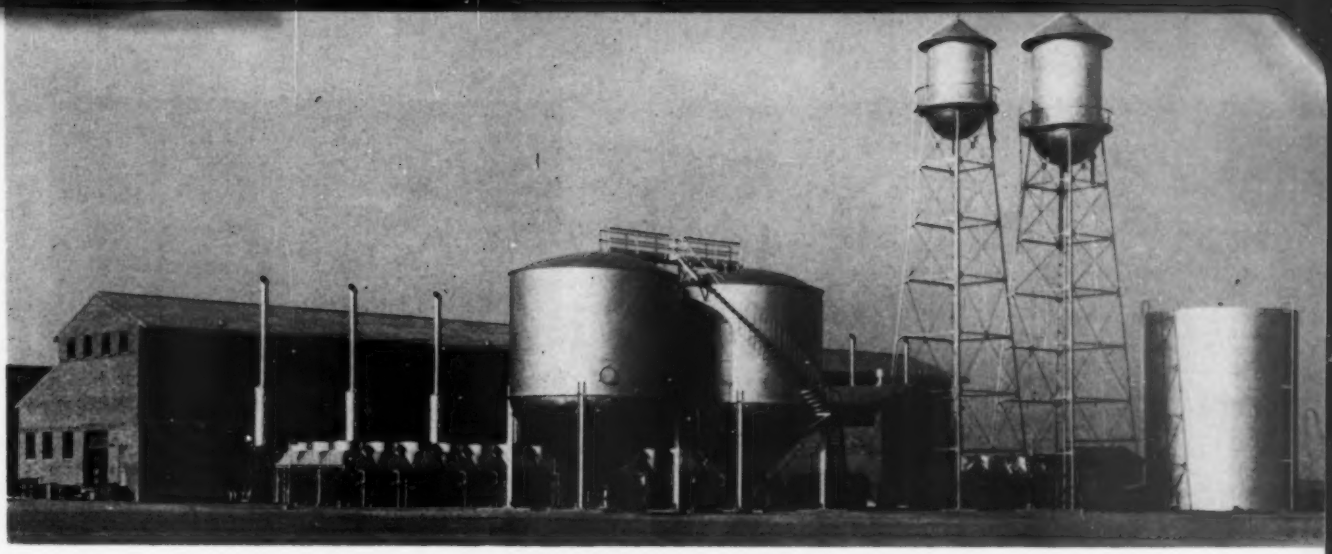
To provide adequate power for the various buildings at each station an 1,800 kw electric system has been installed which is as large as that normally used by a city of 7,000 inhabitants. Air conditioning is accomplished by chilling water in York refrigerating units at a central point and by pumping the cold water through insulated mains to various dwellings and other buildings. Each structure is individually controlled. With outside temperatures of 125° the buildings are a comfortable 80° to 85°. To counteract the severity of the sand problem, large fans are installed in the pumphouse, drawing air from the outside through a water bath and producing a small positive pressure inside the building which prevents the sand from seeping through crevices around doors, windows and other joints. The air intake for the engines is inside the building, so only clean, cooled air is used.

On the basis of a throughput capacity of 300,000 barrels daily the line is equipped with six pump stations. Six intermediate stations can be installed to increase line capacity to 500,000 barrels daily. Pipe of suitable wall thickness has been laid to provide for the insertion of the secondary stations.

The initial station in the Abqaiq field is the only one at which pumps are driven by steam. Here Aramco had available unlimited quantities of natural gas for fuel and an existing steam plant required for crude stabilization. Abqaiq Station contains two 6,000 horsepower Westinghouse turbines directly coupled to two-stage centrifugal pumps each capable of delivering 340,000 barrels of oil daily against a maximum of 840 psi. Exhaust is used to operate the stabilizer for H_2S removal from crude. Aramco also has a steam operated 30,000 kw power station at this point which provides part of the stabilizer's heating requirements.

Since the high speed pumps employed require pressure on the suction this is provided by vertical pumps in the tank farm each capable of delivering the necessary volume of oil at 75 psi. Pumps for the Abqaiq station were specially designed for the job by Byron Jackson. Pumps operate at 3,600 rpm and are said to be the world's largest as either one will handle the full capacity of the line. Pump casings are cast steel tested to 1,300 psi. Impellers and shaft sleeves are stainless steel. Packing problems have been eliminated by use of throttle bushings on mirror-finished

Aerial view of crude storage tanks at Sidon. Tanks are on a hill 370 feet above sea level permitting gravity loading of tankers. Photo courtesy Graver Construction Corp.



Tapline pumphouse at Qaisumah showing battery of air coolers, water and fuel tanks.

sleeves. Small leakage through the bushing is collected and pumped back into the line.

The remaining five stations are all inland where water is a problem, the entire quantity being obtained from wells. For these stations Diesel power was selected. Worthington has supplied 24 eight-cylinder 1,710 horsepower engines for driving the single-stage pumps through speed-up gears. The engines operate at 343 rpm and the pumps at 2,200 rpm. The engines are supercharged 4-cycle units with a bore of 16 inches and 20 inch stroke. Fuel is bled from the crude line, settled and filtered. Each engine consumes between 1,500 and 2,000 gallons per day. The three 800 kw General Electric generators are driven by smaller six-cylinder Diesels with a horsepower rating of 1,320. Five of the larger engines are installed at each station. Of these four drive the pumps and one is a stand-by. Similarly one stand-by and two operating engines are provided for electrical generation.

The single stage pumps are set in series with approximately a 210-lb. differential per stage giving a discharge pressure of about 840 psi. Normally four are operated with the fifth in stand-by. Individual pumps are by-passed with lines containing check valves and have motor operated suction and discharge valves. Any unit thus can be started and stopped without disturbing other units.

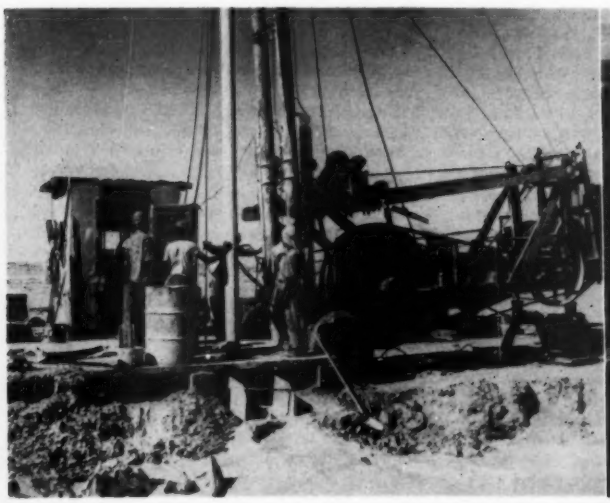
In addition to the cooling system previously mentioned the auxiliaries which must be handled by the electrical generating system include the extended-surface dry air-blown radiators used to cool jacket water and lubricating oil. An accompanying photograph shows a battery of Alco coolers installed for this purpose.

Fans in the coolers employed at desert stations are directly driven by individual electric motors vertically mounted. Fans are fitted to motor shafts. Motors and other key parts were especially shielded to prevent dust damage. Each of the coolers is individually controlled so that any one may be cut out at will. Fans in the Alco units are placed above the cooling surface and hot air is discharged high above the cooler so that it cannot be recycled to reduce cooling efficiency.

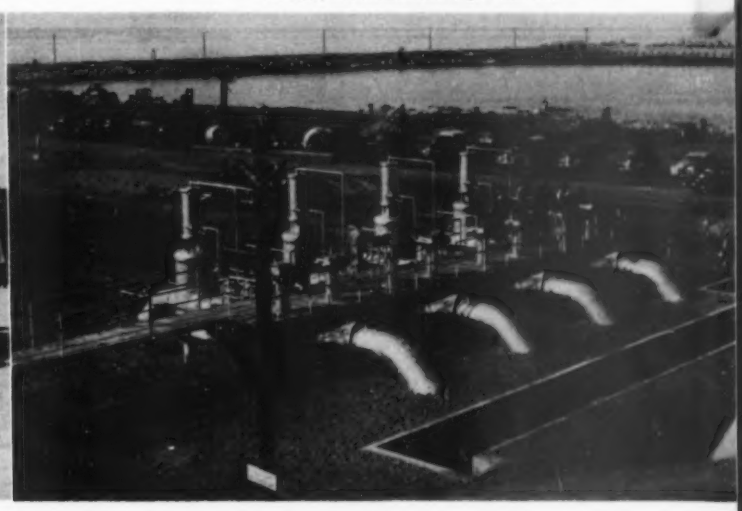
The stations are piped to permit either a straight-through basis with closed suction or by floating a 96,000 barrel tank on the line. Booster pumps are installed to provide suction pressure for the first main line pump. The open tankage method of operation was selected because of the difficulties which might otherwise appear due to temperature changes between day and night, particularly in the area where the line is laid above ground. More oil is received by each station in the daytime than is pumped and more is pumped out at night than is received. If, on a long line, this differential were permitted to accumulate it might result in a loss of line capacity.

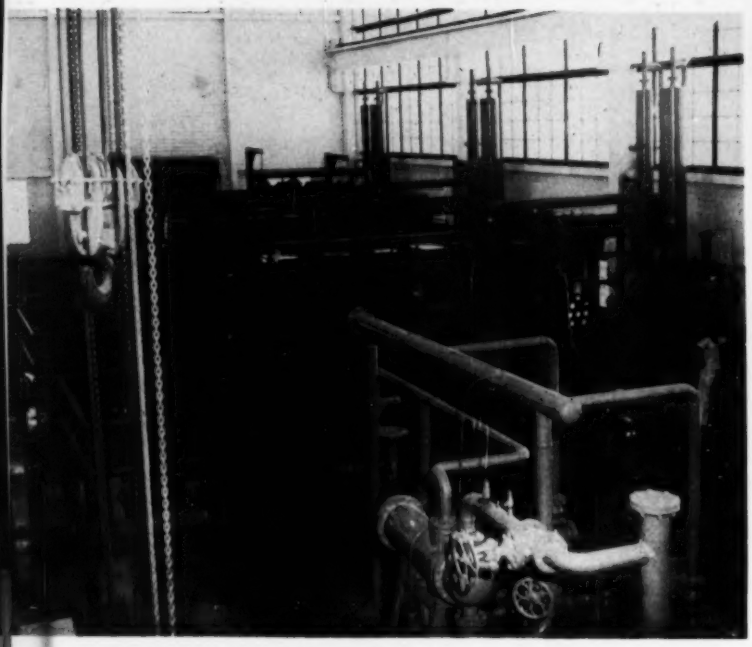
Control valves are installed on both incoming and outgoing lines to prevent overpressuring the line especially at times when it may be operated as a closed system. In ad-

One of the forty desert water wells being drilled along the pipe line right of way.

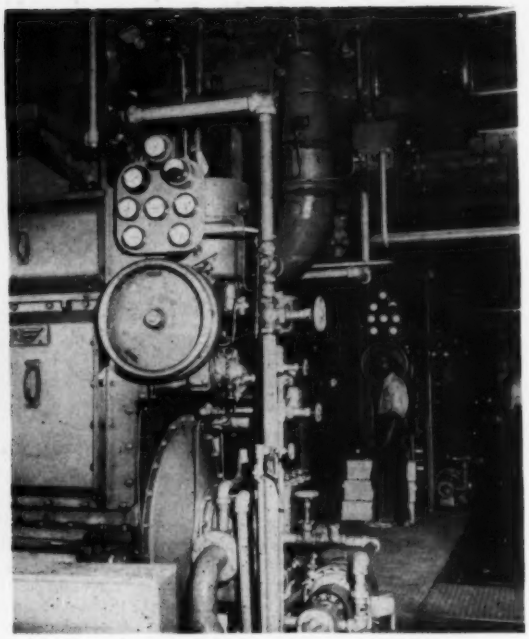


Four valves which control submarine loading lines at Sidon. Photo courtesy Trans-Arabian Pipe Line Co.





At each desert pump station three 900 kw generators driven by 1,320 hp diesels provide auxiliary power and light.



Interior view of Badanah station where five 1,710 hp diesels drive the crude pumps.

dition trips have been installed to shut down one or more engines if overpressure is built up on the discharge side of the pumps.

Pump and engine houses are 70 by 230 feet with the pump room separated from the engine room by a gas-tight wall.

R.C.A. short wave radio was selected for communications, partly because it had been noted that Aramco field parties always got very good reception with low powered two-way sets used in automobiles. It has been noted that 15-watt automobile transmitters have been able to send good signals some 500-600 miles and 850-mile transmission by 300-watt transmitters has been good.

Two separate systems have been installed by Tapline. One is for through traffic from Qaisumah to Beirut and the other for dispatching between pump stations. The through system utilizes 1,000-watt output feeding to reflector antennas. The dispatching system utilizes two frequencies and is used to send messages to any or all of the stations at distances varying from 125 to 1,000 miles.

In addition to the 96,000-barrel crude tank at each station two conical bottom tanks of 2,000-barrel capacity have been erected to store Diesel fuel. A 70-foot elevated tank of 10,000 gallons capacity is provided for distilled water and a similar tank twice as large for the storage of treated water. Raw water is pumped from wells to a 30-foot diameter by 40-foot storage tank before distillation or treatment. Well water in Arabia is pretty bad, carrying usually 3,500 ppm of total solids of which 750 or more is hardness.

A special pump station is not required at Sidon for loading tankers because of the steep slope uphill from the seacoast which permits gravity loading. The tank farm is placed 370 feet above sea level. Storage consists of sixteen 180,000-barrel floating roof tanks of which three are earmarked for bunker fuel working tanks and one 25,000-barrel slop tank. Bunker fuel will be pumped to ships with 260 horsepower General Motors twin engines driving pumps. Four such units, each Byron Jackson centrifugal, have a capacity of 5,500 barrels per hour at 84 psi differential.

Crude storage tanks are connected with the offshore tanker loading berths with 14 miles of 20 and 30 inch pipe. Fuel receiving and loading lines are 12 to 18 inches in diameter.

Tanker loading berths are a mile off shore where water is 55 feet deep. Two of the four berths are equipped with a 30 inch loading line, capable of delivering crude at the rate of 26,000 barrels per hour and two with 20 inch lines and a loading capacity of 19,000 barrels per hour. With all four berths operating simultaneously the terminal can load out 90,000 barrels per hour. The first 20 hours of operation saw 723,334 barrels of crude loaded into four tankers.

Loading of tankers is controlled from a central board in the shore manifold control house. Tank farm valves are remotely controlled from a central point. Dual light and bell warning signals have been installed to indicate high and low level conditions in tanks. Communication from control house ashore to tankers is both by cable and radio.

Installation of submarine crude and fuel lines was made with the aid of a temporary rail line a half mile in length on which 1,760 foot sections of doped and wrapped pipe were loaded on dollies. These were launched with the aid of tugs at sea and tractors ashore. The 30-inch lines were floated to position but smaller lines were supported by buoys until ready for submersion. Once in position the lines were fixed in place with concrete anchors placed astride the pipe.

Tankers are moored at loading berths with permanently fixed anchors from which chains are led to the surface with heavy steel buoys.

The Sidon terminal is actually about four miles from the ancient city of that name and about 35 miles from Beirut. The property has a shore area of some 700 acres with a water frontage of a little over a mile. Personnel housing is in the nearby town of Sidon.

As previously mentioned Tapline drops about 1,500 feet in its final 20 miles. Pipe diameter for the last 4.9 miles of the line has been reduced to 22 inches. To prevent the line from running partially empty and to minimize surges a back-pressure control system has been installed. This consists of 12 three-inch friction tube bundles each 40 feet in length connected in parallel. Depending on rate of flow one or more of these may be employed to maintain an adequate back pressure.

Williams Brothers built the Sidon terminal with the exception of the tankage which was erected by Graver Construction Co. Graver also built the Turaif pump station, the one nearest the western end of the line. H. A. Scott was general project manager for Graver. Cole Elliott supervised tankage erection at Sidon and Leon McCarmack was job superintendent at the Turaif pump station.

Oil Industry Moves Toward Full Mobilization

WASHINGTON

By Joseph B. Huttlinger

SIX months after the outbreak of the Korean war, the American petroleum industry at home and abroad is engaged in a mobilization of increasing momentum. Each month the requirements of the military rise higher as more tanks, ships and airplanes are being put into service, both for fighting and training. In addition, the demands of civilian and wartime industries keep mounting.

Thus far, all petroleum demands have been met with little strain; confidence is widely expressed that they will be met in the future, without the need for rigid government controls, unless full scale war breaks out, and with little disruption of normal patterns of civilian supply.

This confidence was highlighted at the National Petroleum Council meeting in December. There, Secretary of the Interior Oscar Chapman called for an "all out" effort by the oil industry. Council members expressed hearty endorsement. Chairman Walter S. Hallanan added: "The oil industry is better equipped and prepared today to meet whatever emergency may arise than it has been at any other time."

Most dramatic Washington symbol of the mobilization lies in the naming of Bruce K. Brown, president of Pan-American Southern Corp., New Orleans, as the "dollar-a-year" deputy director of the new Petroleum Administration for Defense. He is directly under Secretary Chapman, who called him "uniquely qualified." A former deputy head of the World War II PAW, Mr. Brown has been chairman of the Military Petroleum Advisory Board. In one of his first actions, he prepared to integrate the MPAB with the PAD.

In his address upon becoming PAD deputy head, Mr. Brown told oil men in Houston, Texas, that the first bottlenecks for petroleum have cropped up in transportation and refining. More tankers, tankcars, pipe lines and barges are needed, he said. More aviation gasoline and Navy diesel fuels are required from refineries. The output of present plants must be increased, and new ones built. Tentative aim of the PAD is an avgas production of 150,000 barrels daily early this year.

To discuss tankers, Mr. Brown called in executives of 35 companies in December for a special meeting. While the situation is tight at this time, an optimistic picture for the near future is given in a "most comprehensive" report on transportation just adopted by the National Petroleum Council in its year-end meeting. Construction under way and planned, said the report, would furnish adequate overall transport capacity to meet any demands that now can be foreseen.

Bruce K. Brown

A drive for new large diameter pipe lines is getting started. Chairman W. Stuart Symington of the National Security Resources Board has shown interest in one of these projects, a proposed West Texas-California, 20-inch line. "It's a good idea," he wrote Mr. Brown, in a memorandum. If Mr. Brown and the PAD agree, they, presumably, will recommend the line, and then fight for the steel to get it built.

The production job of the oil industry lies just ahead. To do it right, according to American producers, will require the drilling of 43,000 wells this year, an all time record. PAD, agreeing, has asked Commerce's National Production Authority to allocate the needed quantity of steel. As matters stand now, some producers are having trouble obtaining sufficient supplies of the metal. This is one of the problems likely to receive early attention from the new war production organization headed by Charles E. Wilson.

Domestic reserve capacity is under study by the National Petroleum Council. The council's answer should be forthcoming shortly and provide a more definite indication as to how much domestic production should be stepped up. Along this line, the Interior Department is using the demand for crude, and the possibility that outside supplies might be lost to the United States in a war, to plump for early development of oil shale, coal and other synthetic sources of petroleum.

The heart of oil industry expansion, however, is steel. Given the "necessary materials, equipment and manpower," the oil industry will supply all the oil needed by the military and civilian population, Mr. Brown has promised. The magnitude of the steel needs are shown in a Council report estimating that oil will require about 10 percent of the nation's total steel production during the coming year. While the oil industry has told what steel it needs, NPA is to decide just how much it will get.

"Shortages or feared shortages are by no means confined to oil country tubular goods," says Mr. Brown. "Tank car construction programs, privately financed and ready to go, are slow in execution. Even the rehabilitation of World War II 100-octane gasoline units is rendered difficult by the relative unavailability of certain alloys. New pipe line projects for both oil and gas are serving notice of needs for very large quantities of pipe. An expanded barge construction program is in the offing.

"The needs of American oil companies operating abroad, while not a large proportion of the total requirement, must have special attention because of the additional complications of the supply operation which necessarily involves still other agencies of government and foreign governments, as well as specialized problems in the fields of inventory and practical delivery of the needed items."

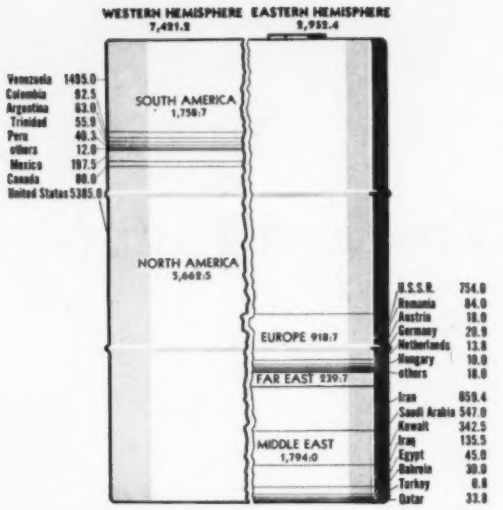
Steel, of course, is only a symbol, although the largest, of the material needs of the oil industry. Numerous other materials and chemicals are so short that the government has requested the NPC to make a study of supply and demand. The items specifically under study are copper, aluminum, zinc, cobalt, nickel and sulphur, all so scarce the government has ordered civilian cutbacks in their use. NPC's report is expected soon.

For liaison with the oil and gas industry in the coming months, Mr. Brown plans to rely upon the National Petroleum Council, a lineal successor of the old Petroleum Industry War Council. In fact, the council has just nominated itself to serve as the government's advisory group. Roadblock toward immediate acceptance of the offer has been the council's desire to name its own chairman from the industry, while the administration has shown preference for a government man. As the government's advisory group, the council is to be fully representative with marketing segments of the natural gasoline and gas industries and makers of petroleum equipment included.

Tidelands control figures in the situation. The Supreme Court adopted a decree Dec. 11 confirming federal authority over waters offshore of Texas and Louisiana. Secretary Chapman gave present operators 60 days to continue activities but after that drilling must be under contracts signed with the government. This has stimulated Congressional advocates of state control to renew plans for enactment of a quitclaim law in time to beat the deadline. A compromise on the issue may be the outcome.

Recent additions to the PAD staff include Frank Watts, general sales manager of Humble Oil & Refining Co., who has been named as director of materials and Cecil L. Burrill formerly of Standard Oil Co. (N.J.), who is to be the program director.

Fully meeting expanded requirements for oil in both peaceful and defense pursuits, the petroleum industry set new marks in 1950 with crude output rising above eleven million barrels per day.



1950 world production, thousands of barrels daily.

1950 World Production Up 11.1 Percent

WORLD production of crude oil increased 11.1 percent in 1950. Total output for the year was 3,785 million barrels according to estimates based on latest available reports from the various fields. In 1949 the total was 3,406 million barrels.

Daily average production crossed ten million barrels in June for the first time in history and has continued steadily upward for the last half year. Average for December is estimated at 11,267,000 barrels daily.

As has been the case in recent years the rate of rise in output was greater in the eastern than in the western hemisphere. The eastern half of the world increased production 18 percent to 2,952,400 barrels daily while the western hemisphere reported an increase of 8.5 percent to 7,421,200 barrels daily.

Most spectacular increases in the west were in Canada, Mexico and Venezuela. Canadian output rose 39 percent, Mexican 18 percent and Venezuelan 11.8 percent. United States increase was 6.8 percent. Among the small producing nations Chile and Brazil showed very large proportional increases.

European production was largely static except in Soviet Russia where an increase of 9.3 percent was attained.

The Middle East continued its strong upward trend by expanding production 24.8 percent. Enlargement of pipe line facilities permitted an increase of 60 percent in Iraq production. Average for 1949 was 85,000 barrels daily and for 1950 it was 135,500 barrels. At the end of the year production was at the rate of 162,000 barrels daily.

Kuwait production was 41.5 percent greater in 1950 than in 1949 and, starting from a larger base, the actual increase was about double that reported by Iraq. Iranian output increased 17.6 percent to 659,400 barrels daily. Actual increase in barrels daily was a little short of that in Kuwait. Saudi Arabian output was 70,000 barrels daily or 14.7 percent higher. Deducting the quantity required for filling Tapline and its storage the net increase available for sale was around 50,000 barrels daily or about 10.5 percent.

The western hemisphere produced 71.5 percent of the world's oil supply in 1950 as compared with 73.3 percent the previous year. The United States share of world output was 52 percent compared with 54 percent in 1949. Venezuela gained slightly, from 14.2 to 14.4 percent. The Middle East, which had passed Venezuela in 1949 to produce 15.4 percent of the world's oil was up to 17.4 percent.

Drilling operations in Mexico were at a new high in 1950 and production was higher than at any time since 1926. Crude production in the first nine months was up 21.5 percent over 1949 to 53.3 million barrels or 195,000 barrels daily. Estimated production for the year is 72 million barrels compared with 62,097,000 in 1949. Mexican production reached its peak in 1921 at 193 million barrels and declined steadily from that time until 1942 when a low of 34.8 million barrels was produced. Increase since that time has been steady.

In the first nine months Petroleos Mexicanos drilled 135 wells, an increase of 20 percent over the same period in 1949. Footage drilled totaled 528,832 feet. Total completions for the year will approximate 180 compared with 158 in 1949. Most of the drilling was carried on in previously discovered fields with the result that the success ratio was high. In the third quarter only one well out of 53 drilled was a wildcat and five exploratory wells were sunk in the first half of the year. In October, Pemex announced the successful completion of a wildcat drilled on the basis of surface geology near South Amatlan. Initial production was 315 barrels daily from 3,463 feet. Pemex believes the discovery portends further success at about 6,000 feet and in other areas parallel to the Golden Lane. Earlier in the year a new and deeper limestone horizon was found at the southeast edge of Poza Rica which gives evidence of being important. In the El Plan salt dome production was extended a mile with four good wells.

Venezuela's slight drop in output during 1949 was more than offset by a substantial gain of 11.6 percent in 1950 bringing the daily average up to 1,495,000 barrels. Production increased throughout the year exceeding 1,600,000 barrels daily in its final period.

Drilling operations last year were confined largely to development work in established fields but with the substantial rise in demand exploration activity is expected to increase during the coming season. The government has not yet taken action as proposed early in the year in offering new concessions, but with the establishment of its new Ministry of Mines on January 1, some development in this direction may take place.

Completion of the pipe line from Spring Hill and tanker loading facilities has permitted an expansion of production in Chile during the past year. Recent production averaging 1,500 barrels daily has been augmented by a new discovery in the Cerro Sombrero area about ten miles from previous production. The new well came in at about 300 barrels daily. Some crude is being trucked out and plans are afoot to connect the well by pipe line with the tanker loading station.

Canadian oil production averaged 80,000 barrels daily in 1950 compared with 57,500 barrels per day in 1949, an increase of 39 percent. The Prairie Provinces were producing enough crude to take care of local demands and to fill the Interprovincial Pipe Line as rapidly as it was laid. Production exceeded 100,000 barrels daily in November and then declined seasonally in the final month of the year. Production was, of course, lower

than ability of the field to produce. When navigation opens on Lake Superior in the spring output will increase materially.

Wildcatting continues unabated in the west, centering in Alberta. More companies have been acquiring acreage and conducting geophysical surveys. Sinclair Canada Oil Co., for example, has just teamed up with British American Oil Co., Ltd., on a joint exploration campaign covering 900 square miles.

After a considerable run of wildcat completions without success in the early months of the year Canadian wildcatters were cheered by a number of important discoveries. Notable among these is the Socony-Vacuum Exploration Company's development in the D2 and D3 formations 12 miles southwest of Camrose, in what has been named the Duhamel field. This is still a one-well field.

Canadian Gulf Oil Co. added a new field to Alberta early in September when it found a Devonian reef productive in the Big Valley area 80 miles northwest of Calgary and some 17½ miles south of the major Devonian field the company discovered at Stettler in 1949.

September also saw a new Devonian discovery by Texaco Exploration Co. and McColl Frontenac Oil Co. four miles southwest of Leduc. The extent of these new discoveries will not be known until more drilling has been done but it is estimated that new discoveries of 1950 plus extensions of previous fields have brought western Canada reserves up close to two billion barrels.

Production in Soviet Russia is estimated at 754,000 barrels daily in 1950 as compared with 690,000 barrels daily in 1949. In its most recent report to the United Nations statistical office the U.S.S.R. reported that third quarter production of this year was 104 percent of plan, first quarter production was 94 percent of plan and second quarter 104 percent of plan.

Comparing production with 1947, the Russians showed third quarter production as being 141 percent of the third quarter in 1947. A year ago third quarter output was 126 percent of 1947 and third quarter 1948 production was 108 percent of 1947.

Based on these reports it may be calculated that third quarter production of the U.S.S.R. in 1950 was 762,000 barrels daily. Projecting the curve at its recent rate of rise suggests an average for the fourth quarter of 785,000 barrels daily and an average for the year of 754,000 barrels.

Saudi Arabia produced approximately 200 million barrels of oil in 1950, an average of 547,000 barrels daily compared with 174 million barrels, averaging 476,736 barrels daily in 1949. Of the 26 million barrel increase about seven million was required to fill the new Trans Arabian Pipe Line and its storage tanks at Sidon so that the increase going into trade channels was roughly 19 million barrels or 10.9 percent.

Of the seven known fields in Saudi Arabia three were being produced in 1950 and four were shut in. Beginning early in 1951 the Ain Dar field will be connected with the pipe line and brought into production.

At the end of 1950 there was 92 oil wells and one gas well being produced. Average daily production per well was 1,460 barrels. There were 26 shut in wells previously completed as producers. Drilling in 1950 was restricted to step-out operations with 20 completions. All drilling was successful.

Kuwait production in 1950 averaged about 342,500 barrels daily as compared with 242,000 barrels per day in 1949, an increase of 41.5 percent. Drilling was continued throughout the year with two rigs. One rig was employed in clean-out work. At the end of the year there were 99 producing wells in the Burghan field.

Between Kuwait and Saudi Arabia the American Independent drilled three wildcats all of which were unsuccessful. Qatar production which was begun the first of 1950 at 27,000 barrels daily was up to 40,000 barrels per day at the end of the year. Superior Oil Co. is planning off-shore operations near Qatar when boundaries are settled.

In Indonesia there are still areas where political unrest has prevented the resumption of normal operations by foreign oil companies. Conditions have improved in Sumatra with the result that central areas are being developed. Nederlandsche Pacific Petroleum Maatschappij which has some 2.4 million acres in central Sumatra has been developing the Minas field where 35 gravity oil is found in the lower Miocene at 2,500 feet. A great deal of preparatory work had to be done before actual operations could get under way.

Operations in southern Sumatra are proceeding normally by Standard-Vacuum and Shell companies. There have been some labor difficulties resulting in temporary work stoppages but these have not seriously affected operations. Production has tended to rise. Rehabilitation work in pre-war fields has been pretty well completed and some new drilling has been done in known fields. British Borneo continues to produce at an accelerated rate. Increase in 1950 was 12.5 percent.

As it has been the case throughout its history the petroleum industry has shown again that it has the ability to meet sharp increases in demand on short notice. For 1951 it is clear that there will be plenty of oil if equipment shortages do not curtail operations.

WORLD PRODUCTION, PROVED RESERVES and RESOURCES

(Billions of Barrels)

Country or Region	Cumulative Production Jan. 1, '51	Proved Reserves Jan. 1, '50	Estimated Ultimate Production
United States	40.9	24.7	110.0
Bal. North America	2.7	3.0	40.0
Total No. America	43.6	27.7	150.0
Venezuela	5.5	9.5	80.0
Bal. South America	1.8	1.0	
Total So. America	7.3	10.5	80.0
Total Western Hemisphere	50.9	38.2	230.0
Europe, excl. Russia	1.8	0.8	13.0
Middle East, incl. Egypt	4.1	33.0	155.0
Bal. Asia, excl. Russia	1.9	0.4	24.0
Indonesia	0.7	1.1	30.0
Africa, excl. Egypt	...	...	8.0
Total Eastern Hemisphere excl. Russia	8.5	35.3	230.0
Russia	6.6	5.0	150.0
Total Eastern Hemisphere	15.1	40.3	380.0
Total World	66.0	78.5	610.0
Total Foreign	25.1	53.8	500.0

Authority: Gail F. Moulton, Chase National Bank of New York (A modification of estimates—1948 by L. G. Weeks)

WORLD CRUDE OIL PRODUCTION

(Thousands of Barrels Daily)

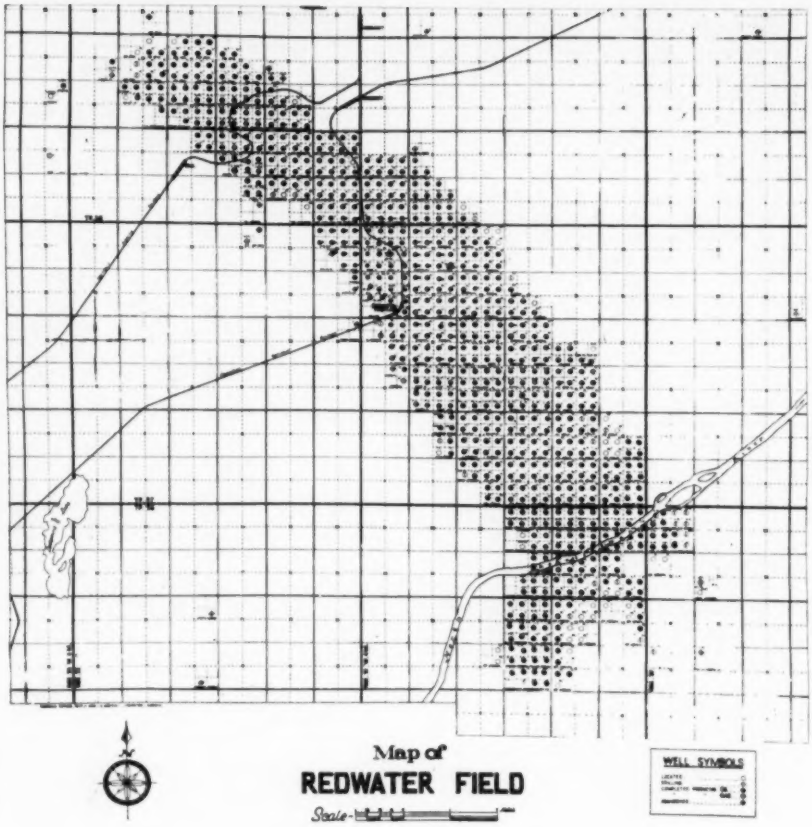
	1939	1948	1949	1950
North America				
United States	3,465.7	5,508.9	5,042.0	5,385.0
Canada	19.1	33.8	57.5	80.0
Mexico	162.0	159.0	167.0	197.5
Total	3,646.8	5,701.7	5,266.5	5,662.5
South America				
Venezuela	567.0	1,339.0	1,321.4	1,495.0
Colombia	65.5	65.1	81.5	92.5
Argentina	51.0	63.8	63.5	63.0
Trinidad	52.8	54.9	56.5	55.9
Peru	37.1	37.5	40.5	40.3
Ecuador	6.3	7.4	7.2	7.2
Bolivia	0.6	1.3	1.9	1.7
Cuba	0.3	0.3	0.3	0.3
Brazil	...	0.3	0.3	1.2
Chile	...	...	0.4	1.6
Total	780.6	1,569.6	1,573.5	1,758.7
Western Hemisphere	4,427.4	7,271.3	6,840.0	7,421.2

	1939	1948	1949	1950
Europe				
Rumania	128.5	79.5	85.0	84.0
Austria	11.7	15.0	18.0	18.0
Germany	12.3	12.3	16.3	20.9
Hungary	3.0	10.0	10.0	10.0
Poland	10.7	2.7	3.3	3.0
Netherlands	...	9.3	11.8	13.8
Albania	2.5	1.0	2.5	3.5
France	1.4	1.1	1.1	2.3
French Morocco	...	0.3	0.4	0.8
United Kingdom	0.1	0.9	0.9	0.9
Czechoslovakia	0.2	0.4	0.8	0.8
Yugoslavia	...	1.1	6.5	6.5
Italy	0.2	0.2	0.2	0.2
Total excluding USSR	170.6	133.8	157.1	164.7
USSR	603.0	611.0	690.0	754.0
Total	773.6	744.8	847.1	918.7

	1939	1948	1949	1950
Near and Middle East				
Iran	214.0	523.0	561.0	659.4
Saudi Arabia	10.8	390.3	477.0	547.0
Iraq	84.5	72.5	85.0	135.5
Kuwait	...	127.2	242.0	342.5
Bahrain	20.8	30.0	30.0	30.0
Qatar	...	...	...	33.8
Egypt	12.8	36.8	43.5	45.0
Turkey	...	...	0.3	0.8
Total	342.9	1,179.8	1,438.8	1,794.0
Far East and Oceania				
Indonesia	170.0	87.3	115.9	139.0
British Borneo	20.0	54.0	70.5	79.3
New Guinea	...	...	4.8	4.8
India	28.0	7.1	5.3	5.5
Pakistan			2.6	2.7
Burma			1.0	1.0
Japan	7.3	3.1	3.7	5.4
China	...	1.8	2.0	2.0
Total	225.3	153.3	205.8	239.7
Eastern Hemisphere	1,341.8	2,077.9	2,491.7	2,952.4
WORLD TOTAL	5,769.2	9,349.2	9,331.7	10,373.6

PERCENTAGE DISTRIBUTION OF PRODUCTION

Principal Nations	1939	1948	1949	1950
United States	60.0	59.0	55.5	52.0
Venezuela	9.8	14.4	14.2	14.4
USSR	10.5	6.7	7.4	7.3
Iran	3.7	5.6	6.0	6.4
Saudi Arabia	0.2	4.2	5.1	5.3
Kuwait	..	1.4	2.6	3.3
Western Hemisphere	76.7	77.8	73.3	71.5
North America	63.2	61.0	56.5	54.6
South America	13.5	16.8	16.8	16.9
Eastern Hemisphere	23.3	22.2	26.7	28.5
Middle East	6.0	12.6	15.4	17.3
Oceania and Far East	4.1	1.8	2.3	2.3
Europe (Including USSR)	13.2	7.8	9.0	8.9



Redwater Now Canada's Top Field

With 700 producing wells and a proven reserve of 800 million barrels Redwater has taken No. 1 place in Canada. It may develop as a billion-barrel field with up to a thousand wells.

By J. L. Irwin

THE Redwater oil field in Alberta has passed its second birthday. For a two year old it has built up an amazing record, passing that of its immediate predecessor, Leduc.

In the short time since its discovery (in October, 1948) Redwater has been extended to cover a known area 14 miles in length and four in width with 700 producing wells and a proved reserve of perhaps 800 million barrels. The field limits appear nearly to have been reached in the north but not to the south. Eventually around 1,000 wells are expected to be drilled in the field. On Nov. 3 six quarter-section leases were sold by the Crown to oil companies at bonuses totaling $1,883,-871. Bid on one other tract was rejected. Four of the parcels sold and the ones which brought most of the money were at the south end of the field.

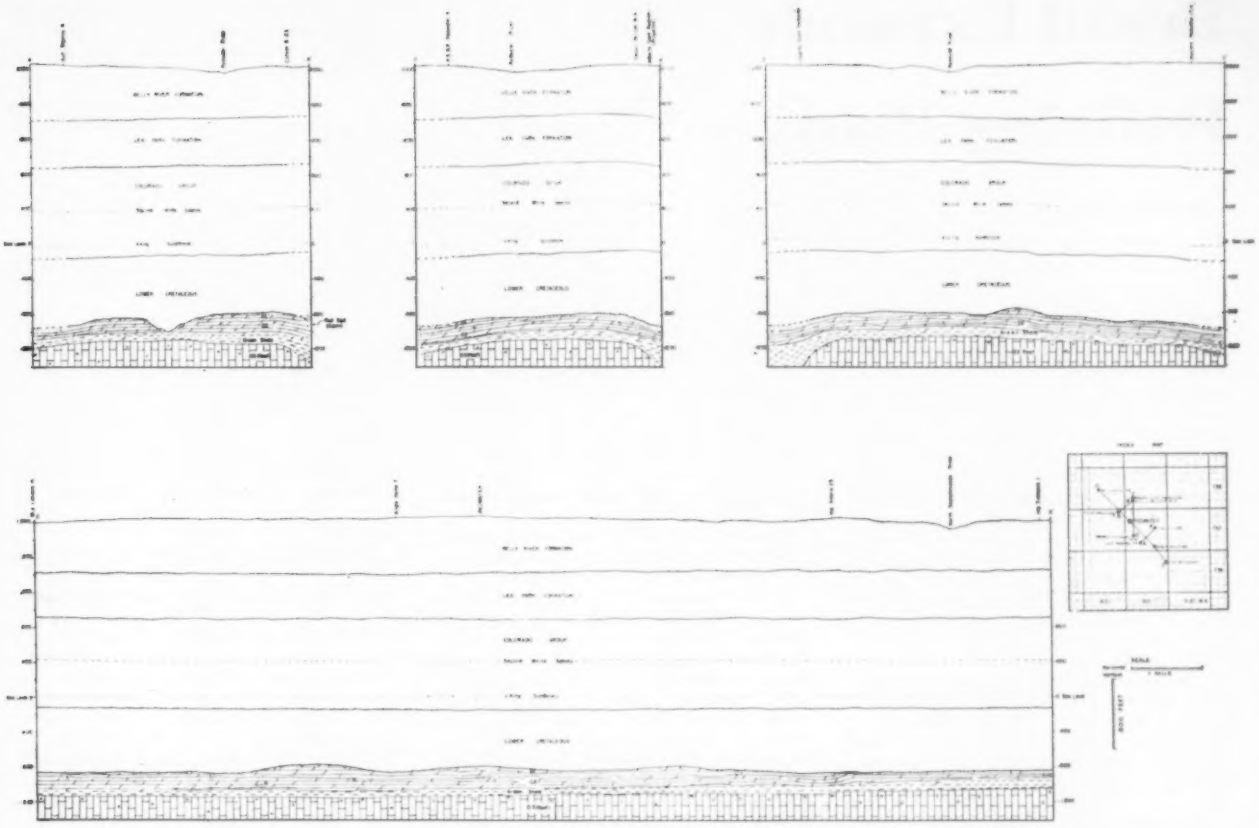
Location of Redwater is approximately 26 miles northeast of Edmonton. Discovery was made by Imperial Oil Ltd. The D2 zone of the Devonian limestone was found to be wet and heavily eroded. Because of this the oil that once presumably had been held in that porous section of the structure had been dissipated in some remote age. The green shale also gave evidence of erosion, but the D3 zone most fortunately seemed to have escaped this, and was extremely productive.

The discovery well boasted 140 feet of porosity containing 35° gravity crude oil. The well was completed at 3,264 feet with daily potential flow of 1,728 barrels. Predictions were made even then to the effect that a second major field had come into being that not only rivaled Leduc, but probably would surpass that field's performance. In view of Leduc's outstanding record, this was a fair-sized prediction to make, but it has come true surprisingly soon.

By the close of 1948, Redwater had a mere seven producers to its credit and a cumulative production of 36,875 barrels. In the weekly progress report of the Petroleum and Natural Gas Conservation Board, dated Oct. 30, 1950, Redwater was producing an average of 54,202 barrels a day from 665 wells.

Looking back on a 1948 annual report covering Alberta's oil activities, it is interesting to read the statement that from knowledge gained at that time the Redwater field was likely to prove some ten miles in length, running from northwest to southeast, and two miles in width, with a reserve of from one to two million barrels of oil per quarter section (160 acres). On this basis the estimate given at that date for the field's total reserve was from 80 to 160 million barrels, which, it was thought, might be substantially enlarged as development continued.

In 1949, 271 producers were brought in and production totaled 4,793,491 barrels. To bring in 271 successful wells in a single field in the space of one year constituted another record for Alberta. Gravity of the oil continued at 35°, depths of wells averaged around 3,200 feet, open flow ran from 1,200 to 1,500 barrels per day, and production was held down toward the close of the year to around 100 barrels per well per day. Alberta had reached the saturation point of the only market available at that time, the prairie provinces, the daily consumption demand of which by the close of 1949 was around 60,000 barrels.



Geological cross sections of Redwater field reproduced through the courtesy of M. B. Crockford, chief geologist, The Petroleum and Natural Gas Conservation Board of the Province of Alberta.

At the beginnirg of 1950, dimensions of the field had enlarged to about 12 miles in length and four in width. A new estimate of 360 million barrels was at that time given as a minimum for the field's reserve.

Redwater celebrated its first birthday, early in October 1949, by discovering an extension to the field south of the river at Simmons. The discovery well there was drilled by Imperial Oil Ltd. The fact was established that the water line depth at Simmons corresponded to that north of the river. The productive zone gave 170 feet of porosity in the D3. Following this, it was stated that with further development of the south end another 100 million barrels might be added to the total reserve of Redwater.

Imperial made its selection of leases from its reservation south of the river, much of the area chosen being regarded as oil bearing structure. On Feb. 9, 1950, the Alberta government sold leases in the various parts of the Redwater area for a total price of $9,122,-145.82. This was a record sale to date. A single quarter section went for $1,519,101, the highest price ever paid for Canadian oil land. The purchasers were Royalite Oil Ltd. and Tanner Brothers and Associates. Over one million dollars each were paid for two other nearby quarter sections. The previous record price to be paid for a Redwater quarter section lease had been $918,000. Of the total price exceeding $9 million, just mentioned as taken in by the provincial government, all but $122,793 was collected for acreage in the Redwater field. This latter amount was obtained from the sale of 33 scattered leases in other parts of the province.

On May 8, 1950, the Conservation Board reported in its weekly progress statement a total of 403 producing wells for Redwater, to compare with 401 for Leduc. Redwater had overtaken Leduc. Since then the lead has been continuously extended. On Oct. 30 the figures nad changed to 479 producers for Leduc and 665 for Redwater. Production rates for the same date were 30,277 barrels as a daily average for Leduc compared with 54,202 for Redwater.

A glance at the Redwater map will show that the northwest to southeast trend changes somewhat south of the river. The toe of the boot runs straight south, and the heel is suggested by a section which runs east. A lot more drilling has to take place between the toe and the heel. Nearly all of it is expected to be successful. If so this will change very considerably the shape of the foot.

The east and west boundaries of the Redwater field, north of the river, seem now to be fairly well determined. The north end of the field requires further development, but the quality of the wells there is not as impressive as in the center and the south.

The most important development of the immediate future probably will be in the southern extension, south of the river in the general Simmons area. Gas pressures are not heavy in Redwater, and some of the wells, north of the river on the east and west boundaries, are pumpers.

In 1949, Alberta's oil production total exceeded 20 million barrels, a record year. In 1950 the total should go beyond 25 million barrels, approximately half of present oil requirements. These figures represent heavily restricted production due to limitations of market pending the recent completion of the Interprovincial pipe line. Completion of the line has created an immediate outlet for nearly four million barrels of oil to fill storage and the line itself.

Because of Alberta's more or less recent acquisition of oil fields of the caliber and performance of Redwater and Leduc, Canada today is definitely advanced on the road which leads to self sufficiency in oil supplies. It has been a long time coming, but due to Alberta's efforts it has come at last. In times of peace or war, any nation with independent oil resources is a world power to be reckoned with. This has long been Canada's objective. There remains little doubt now that it will be reached in the near future.

Brazil Expands Refining Plans

By R. G. Walker

Rio de Janeiro

THE National Petroleum Council is studying a project for another government refinery, with capacity for 40,000 barrels daily, to be erected in the state of Rio de Janeiro. The project has been embodied in the SALTE, or five-year, plan recently approved by Congress. The cost of the work will be guaranteed under an arrangement with the Banque de France et des Pays Bas, which will provide the necessary credits. Arrangements should be concluded before the end of January 1951 when the new government takes office.

This new refinery, plus the three already projected and the Mataripe plant, now operating at Bahia, will enable Brazil to process 120,000 barrels of crude oil daily. Plans for the government refinery at Cubatao (45,000 B/D) and for that of the Drault Ernani group at Manguinhos, Rio de Janeiro, (10,000 B/D) have been approved and the sites are being prepared. According to present calculations both should be in operation by 1954.

Representatives of the National Petroleum Council recently visited the United States to make final arrangements regarding the Cubatao refinery. The original agreement for this plant was made last year with Bechtel Corporation to act in an advisory capacity; with Pan American Hydrocarbon Research, a subsidiary of Hydrocarbon Research Inc., for engineering supervision of construction and initial operation; and with the French group, Compagnie de Fives-Lille and M. M. Schneider et Cie., for materials and equipment. By that time the Mataripe plant will be processing 5,000 barrels from the Bahia wells.

Nothing definite has been announced regarding the preparations for the 2,000-barrel refinery to be erected by the Soares Sampaio group in San Paulo. Should this also be brought into operation by 1954, Brazil will then be refining approximately 120,000 barrels against her estimated daily requirements of 140,000.

Other plans are under discussion for possible later execution. These include the building of a 45,000-barrel refinery at Belem, Para, another in the state of Mato Grosso, and several small ones to supply regional needs in various parts of the country. The Para plant is recommended because Belem is the nearest port to Venezuela, whence crude could be imported, and lies practically in the center of what is expected to become an important oil-bearing region. The Mato Grosso refinery would process crude from the Bolivian oil-fields, which will shortly be reached by the Brazil-Bolivian Railway, now under construction by a mixed Brazil-Bolivian Commission. The Northwest Brazil Railway from San Paulo is already nearing Corumba, in Mato Grosso, and the Bolivian section, with which it will connect, has penetrated some 300 miles inland in the direction of Santa Cruz de la Sierra. One of the original objects of the line was to provide an alternative route, through Santos, for Bolivian oil which is now exported to the Argentine. The sponsors of the Mato Grosso refinery suggest that it will be in the interest of both countries to process Bolivian crude in Mato Grosso, instead of transporting it some 800 miles over a congested railroad for shipment abroad.

In what appears to be an inspired article relating to refining, the Jornal do Comercio observes: "Private enterprise must be stimulated and assisted, wherever it appears with the indispensable requisites of fitness and capacity. Obviously, everything cannot be left to the National Petroleum Council." Other influential journals, during the past few weeks, have urged the need to admit foreign technical and financial co-operation in the development of Brazil's oil resources protected by assurance of a reasonable return on its investments.

In this connection it is interesting to note a recent statement by Dr. Getulio Vargas, the newly elected president. In answer to a press inquiry regarding foreign capital he replied: "The collaboration of such investments is indispensable to our progress. Indeed, Brazil's economic history is full of shining examples in this respect. Therefore any foreign capital, whether it be American, European or Asiatic, which proposes to collaborate with us, will be welcomed and will be assured of the same rights and guarantees as national capital."

The current number of Mineracao e Metalurgia contains an article by Dr. Antonio Seabra Moggi, member of the Cubatao Refinery Commission, on the plans of that plant. The refinery and its complementary works will occupy an area of 235 acres, and its storage capacity will be about 3,100,000 U. S. barrels. The plant is designed for a minimum production of the following quantities, in barrels per working day:

Liquid propane (LPG)	560
Aviation gasoline, 91 octane (ASTM)	2,250
Ordinary gasoline, 76 octane (ASTM)	15,700
Kerosine	4,500
Diesel Oil (No. 2 distillate)	4,500
Fuel Oil (Bunker C)	(not fixed)

The minimum quantity of fuel oil to be produced has not been fixed, as this product is the residue of the others, and varies with the crude oil utilized. The refinery will process crudes from different sources. For this reason three types of petroleum were considered in the project, namely, from Tia Joanna and Officina fields in Venezuela, and from Abqaiq, Saudi-Arabia. Studies to date indicate the following probable yield for the different crudes:

	Barrels per working day		
	Abqaiq	Officina	Tia Joanna
Aviation gasoline	2,250	2,250	2,250
Ordinary gasoline	18,964	19,363	15,750
Kerosine	4,500	4,500	4,500
Diesel oil	4,500	4,500	4,500
Liquid propane	1,650	1,539	1,650
Fuel oil*	11,117	11,617	15,299
Totals	42,981	43,769	43,949

*The quantities of fuel oil have been reduced, bearing in mind the needs of the refinery for the processing of the various crudes.

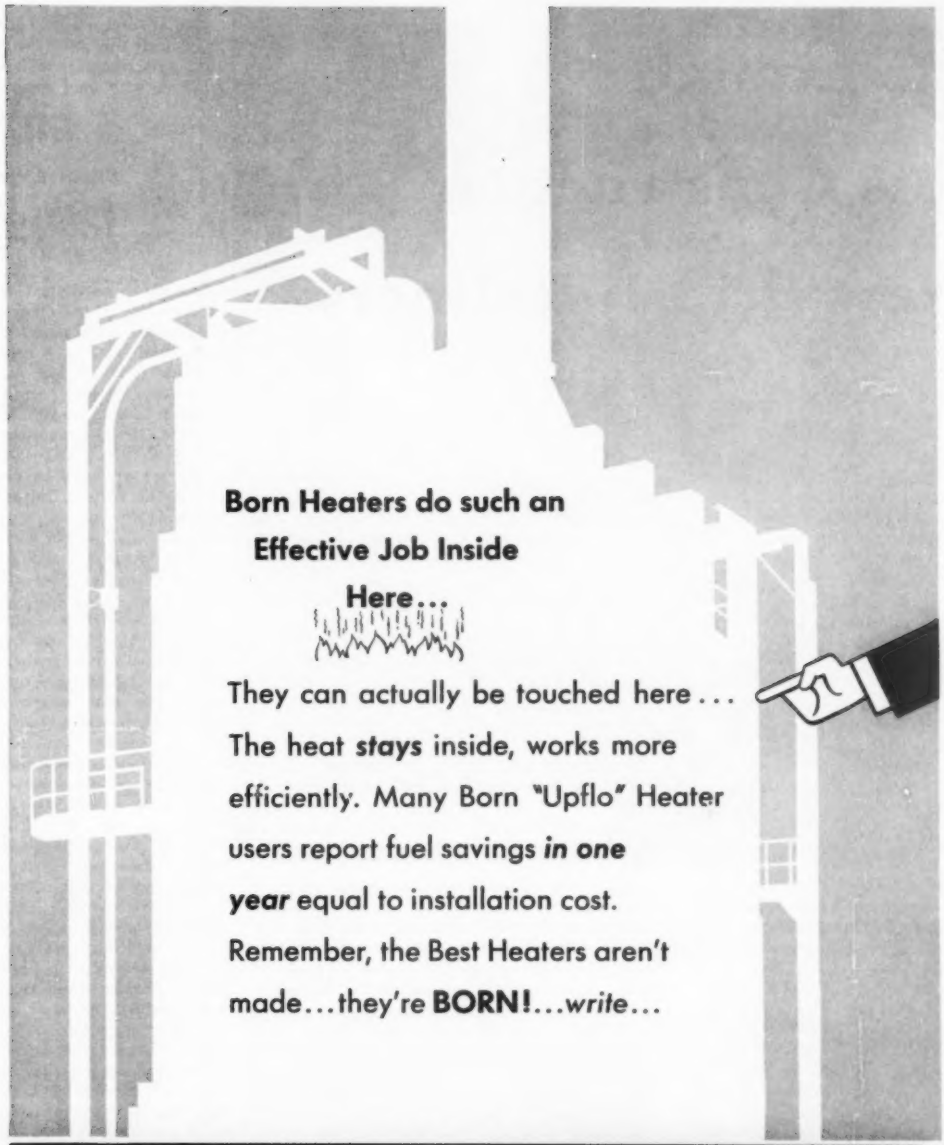
The annual expenditure for 45,000 barrels daily for 330 days at the port of embarkation is estimated at U. S. $25,987,500 for Abqaiq, and $39,055,500 for Officina and Tia Joanna petroleum. The crude will be transported in national tankers, now building, and the annual value of the petroleum products yielded by the refinery is estimated at U. S. $57,008,160 in the case of Abqaiq crude, $57,819,960 in that of Officina and $55,126,170 for Tia Joanna.

The same magazine prints an interesting article on Brazil's oil problem by Dr. Avelino Ignacio de Oliveira, vice president of the Petroleum Council and president of the Brazilian section of the South American Petroleum Institute. He reviews the geological information acquired through exploration and refers to work done by Geophysical Service, Inc., Exploration Surveys Inc. and United Geophysical Co. in geophysical prospecting, by Drilling and Exploration Co. in drilling, and by Schlumberger Surenco S.A., in charge of profilography.

In view of the disturbed international situation the National Security Council has been considering measures to prevent a shortage of fuel if supplies from abroad should be curtailed. Owing to the time which must elapse before natural petroleum is available locally in adequate quantities, the meeting decided to promote industrialization by governmental development of the bituminous schists of the Paraiba Valley. These deposits are situated between the two principal consuming centers, Rio and San Paulo, in a zone served by good rail and road communications. The government's immediate aim will be to insure 10,000 barrels of fuel daily. The funds allotted under the SALTE plan for the development of national oil reserves total U. S. $82,225,000. A refinery will be built at Santos and connected by pipelines to the city of San Paulo.

As reported in the July issue of WORLD PETROLEUM, two private companies are already producing shale oil in the state of San Paulo. One of these, the Companhia Nacional de Oleos Minerais, has been operating since 1937 on a small scale with a locally made installation in the Tremembe-Taubate district. Working with three retorts, it produces daily 880 gallons of fuel oil, 265 of diesel oil and 440 pounds of paraffin. In 1949 the company ordered modern plant from the Foster Wheeler Corp., designed for a daily output of 3,300 gallons of fuel oil. The other company, the Companhia Industrial de Rochas Betuminosas (CRIB), has installed a retort near Pindamonhangaba and exploits shale

(Please turn to page 46)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Anglo-Iranian Begins Construction Of New British Refinery

WORK has begun on the site of new refinery which Anglo-Iranian Oil Co. Ltd. is constructing on the Isle of Grain on the British east coast. It is expected that the plant will be completed in 1953. It will have a throughput of approximately 40,000 barrels daily, operating on crude from Iran or Kuwait. It is designed for annual yields of the following products, in tons: motor gasoline, 640,000; butane, 10,000; gas oils, 560,000; fuel oil, 400,000; lubricating oils, 140,000. When the project for a refinery at this site was first discussed it was reported as a joint undertaking of Anglo-Iranian Oil Co. and Gulf Oil Co. but it has since been announced that it will be built and operated solely by Anglo-Iranian.

The plant was designed by E. B. Badger & Sons (Great Britain) Ltd. and the overall management and coordination of construction will be directed by that company. Power and services will be provided by Ewbank and Partners. Sir Robert McAlpine & Co. are the civil engineering contractors. Rendall, Palmer and Tritten are consultants on the construction of jetties and foundations.

Processing equipment will include a primary atmospheric distillation unit with a daily capacity of 45,000 barrels, linked up with a 12,000 B/D stabilizer, together with a 10,000 B/D catalytic reforming plant, the finishing treatment for spirits being furnished by copper chloride and solutizer treating units. A 3,000-barrel per day catalytic polmerization unit will also be installed.

Coupled with this section will be a 10,000 B/D fluid catalytic cracking unit which will have as auxiliaries, a re-run unit of suitable capacity, copper chloride treating plant, and also a sulphuric acid treating plant for heavy cracked spirit.

Two 17,000 B/D Badger vacuum distillation units are to be installed to handle residue from the atmospheric unit, one mainly producing basic stock for the catalytic cracker, and the other lubricating oil stock; but both can be run conjointly or separately at will to satisfy process requirements for either subsequent process.

Lubricating oil units which are designed to furnish 140,000 tons of finished products per annum will be built under license from the Texaco Company. The first unit will be a 4,500 B/D propane de-asphalting unit built to the designs of The Kellogg Co. The extraction unit of 5,000 B/D capacity will use furfural as a solvent, and will be engineered by The Lummus Co. A 4,000 B/D MEK de-waxing unit is being installed, but at present no plant for wax treating and finishing is projected. For the finishing of lubricating oil, a 3,120 B/D Lummus clay treating plant is to be installed.

The site for the new refinery, although still retaining the name of Isle of Grain, is a promontory formed by the junction of the rivers Thames and Medway. It is protected by a sea wall, as the land is lower than sea level at high tide.

At present there is one deep water jetty, but two more are to be built, which will accommodate 28,000-ton tankers for the import of crude oil, as well as overseas and coastal tankers for the distribution of finished products. Road and rail accommodation is also being provided for internal deliveries.

Tankage, lines and pumps sufficient for the uninterrupted handling of crude and finished products are to be installed.

In addition to workshops, laboratories and offices, canteens are being provided as the site is far from the usual amenities, and it is possible that housing for key workers may be provided in conjunction with the local housing authorities.

Electric power will be taken partly from the Grid, which will be linked in with the works power station. This latter, will have pass-out turbines reducing steam pressure from 650 psi to 175 psi for use in process and pumps. Power will be distributed throughout the refinery at 11 KVA with the necessary step down equipment for 3,300 V and 440 V.

The steam generating plant will consist of Spearing water tube boilers and the Turbo-alternators of English Electric Co. manufacture. As fresh water is not available in sufficient quantity for this purpose, salt water will be used. A low lift pump house will be installed on a small jetty, and the discharge from it will run down a flume to a refinery pumphouse, from which it will be distributed through the refinery system at the required pressure.

The atmospheric and distillation and ancilliary units are scheduled for completion by 1952, the remainder of the units to follow in sequence with total completion by mid-1953.

Brazil Expands Refining Plant

(Continued from page 44)

beds with an oil content varying from 14 to 15 percent. Three other retorts are being installed enabling production to start on a commercial scale at a rate of 2,100 gallons of crude petroleum per day. This company plans to install three groups of 16 retorts each in order to distill 1,000 tons of shale daily, which will produce approximately 26,000 gallons of crude oil. As fuel CRIB will use part of the gas produced by distillation and will market the surplus, estimated at 300 cubic meters (1,890 barrels) per metric ton. The construction of a gas duct from Pindamonhangaba to the city of San Paulo, a distance of 102 miles, is under consideration. The cost will amount to $2.2 million U. S.

The National Petroleum Council has been instructed to carry out exhaustive prospecting of Brazil's impregnated shales and schists and to furnish the government with an estimate of the total reserves available and economically exploitable in all parts of the country. In addition to the immense beds in San Paulo and the southern states, the principal areas, as defined by the American geologist, Dr. R. Arnold, are those of Marau in Bahia; an area 25 to 45 miles north of Maceio in Alagoas; and part of the Serra do Araripe in Ceara. Dr. Arnold reported that all these are of high commercial value.

A British company began exploiting the Marau deposits in 1888, but technical and financial difficulties obliged it to close down in 1893. According to Dr. Elias Coelho Rodrigues, the Henderson retorts which proved so successful in Scotland, were unsuitable for the Marau material. This coated the walls with a residue which accumulated and choked the retorts, necessitating frequent long stoppages for clearing. A campaign in favor of exploiting these and other deposits was opened in the press immediately after the first World War, during which supplies of fuel became dangerously low and led to serious depletion of forest reserves in all inhabited areas. The necessary private capital was not available, however, and at that time state intervention in economic activities was practically confined to railway developments on a small scale.

The decision to industrialize bituminous schists will not be allowed to interfere with the search for, and refining of, natural petroleum. Drilling operations at Limoeira in Para, at Petras in northeast Bahia, and at Carolina in Maranham, will be accelerated and prospecting will continue in all promising areas.

First and Biggest

oil producers in the Middle East since 1912, Anglo-Iranian Oil Company and its associated companies also operate twelve refineries in Europe, Middle East and Australia ; their sales organisation includes major marketing or supply interests in Europe, Asia, Africa and Australasia, with international ships' bunkering and aviation services.

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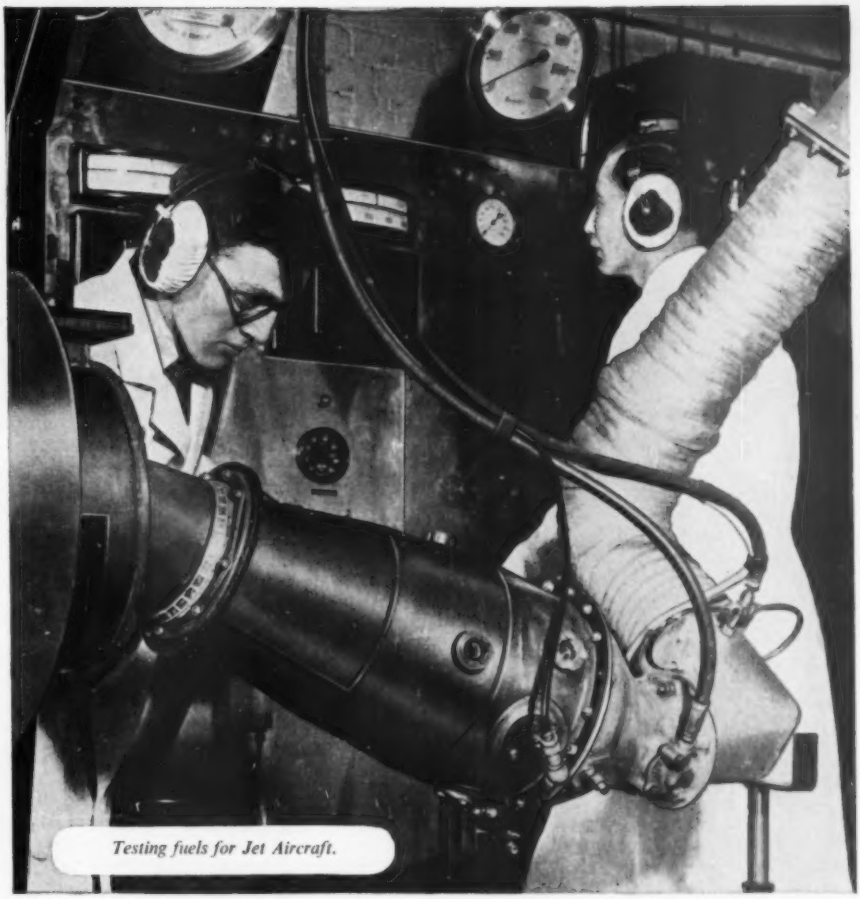
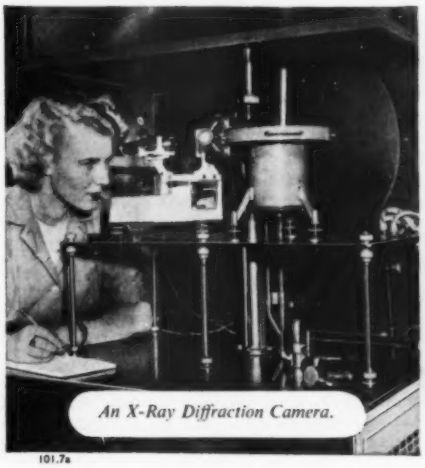
Test Pilots

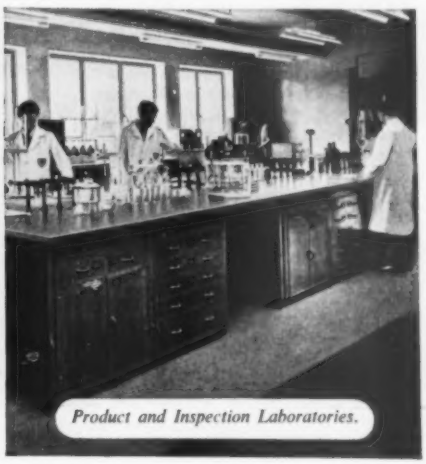


Testing fuels for Jet Aircraft.

World-wide petroleum research activities centre on Anglo-Iranian's principal research establishments at Sunbury, Middlesex, and Kirklington Hall, Nottinghamshire. Since 1915 Anglo-Iranian has continuously developed and pioneered the application of scientific research to the problems of discovery, refining, and utilisation of crude oil and its products.



An X-Ray Diffraction Camera.



Product and Inspection Laboratories.

101.7a

Italian Industry Benefits By Refinery Expansion

NAPLES

General view of the rebuilt Aguila Refinery at Trieste.

OPENING to traffic of the Trans Arabian-Naples pipe line, adding 300,000 barrels daily to the volume of crude oil delivered at eastern Mediterranean ports, is counted upon to strengthen the position of Italian refineries and also that of the country's shipbuilding and ship servicing industries. The effect of this changing trend in transportation will be still further increased during the next two or three years by the completion of other large lines now building or projected which will bring the great bulk of Middle East oil some 3,000 miles nearer to its European markets and when perhaps two million barrels will be moving daily from the eastern shores of the Mediterranean.

Already the rising tide of oil traffic has had a marked effect on the business of Italian port cities despite the fact that much of it has been moving over the long route through Suez. During the first eight months of 1950 cargoes discharged at Naples amounted to 1,700,000 tons of which 1,200,000 tons represented deliveries of crude to the Naples refinery of Socony-Vacuum. Goods loaded during the same period totaled 800,000 tons of which 600,000 consisted of refined products shipped by the refinery. Since the company recently has increased the processing capacity of its plant to two million tons annually the volume of sales may be expected to grow.

This of course is only one example of the growth that has taken place in connection with the reconstruction and expansion of the Italian refining industry. Its effect is not confined to this one industry; it is seen strikingly in the increased activity of Italy's shipyards such as that of Cantieri Navali Riuniti of Genoa which is located at Palermo and is taking advantage of its position directly on the main route between Gibraltar and the East to specialize in the repair and fitting up of tankers of which it has handled an average of 18 per month during the past year. Preparations now under way for adding a new dry dock will enable the yard to double the number of vessels it can handle. The government has under consideration plans for the enlargement of shipbuilding facilities to an extent that will enable the Italian tanker fleet to reach 1,500,000 tons by 1955, thereby giving much greater employment.

Much progress has been made during the past year, in several cases with the assistance of ECA, in measuring the capacity of the refineries of Italy and Trieste which is expected to rise from its 1948 figures of 4,500,000 tons yearly to 8,000,000 tons by the end of 1952. The Aquila refinery at Trieste, which had a 600,000-ton processing capacity in 1948, has undergone substantial enlargement during 1950 with the aid of ERP funds. It has placed in operation a reforming plant for the output of high octane benzine five months after the arrival of the first equipment and machinery from the United States. The refinery is also about to place in operation its plant for the output of lubricating oil which is to have a capacity of 30,000 tons yearly with a viscosity index of 95. For the operation of these plants Aquila has built a new steam electric center consisting of two steam boilers working at 40 atmospheres and three turbogenerators of 1,000 kw.

Much progress has been made in the expansion of La Spezia refinery operated by Industrie Petrolifere Italiane (INPET) belonging to the Shell group which has placed in operation a reforming plant obtained from one of the existing Dubbs sets and has started the construction of a new distillation unit, a new gas recovery and compression unit and a modern white products refining plant with the result that the La Spezia refinery is to be in position to increase its crude oil processing capacity of 1,700,000 tons yearly by 1952. On the other hand, the Shell group has postponed the carrying out of the project for construction of a 2,500,000-ton yearly crude oil processing plant at Apuania north of La Spezia which was to have been connected by pipe line with the Po Valley for marketing refined products in northern Italy.

Stanic, the combination formed between the Standard Oil Company of New Jersey and the Azienda Nazionale Idrogenazione Combustibili (ANIC), has started the reorganization and enlargement of the Bari and Leghorn hydrogenation plants which are being replaced with modern distillation, cracking and reforming units. By 1952 the Bari refinery will have a crude oil processing capacity of 500,000 tons per year and the Leghorn refinery a crude oil processing capacity of 1,500,000 tons per year. Storage capacity is to be enlarged at both refineries as well as the docking facilities.

Three refineries are to be placed in operation in 1951. These are:

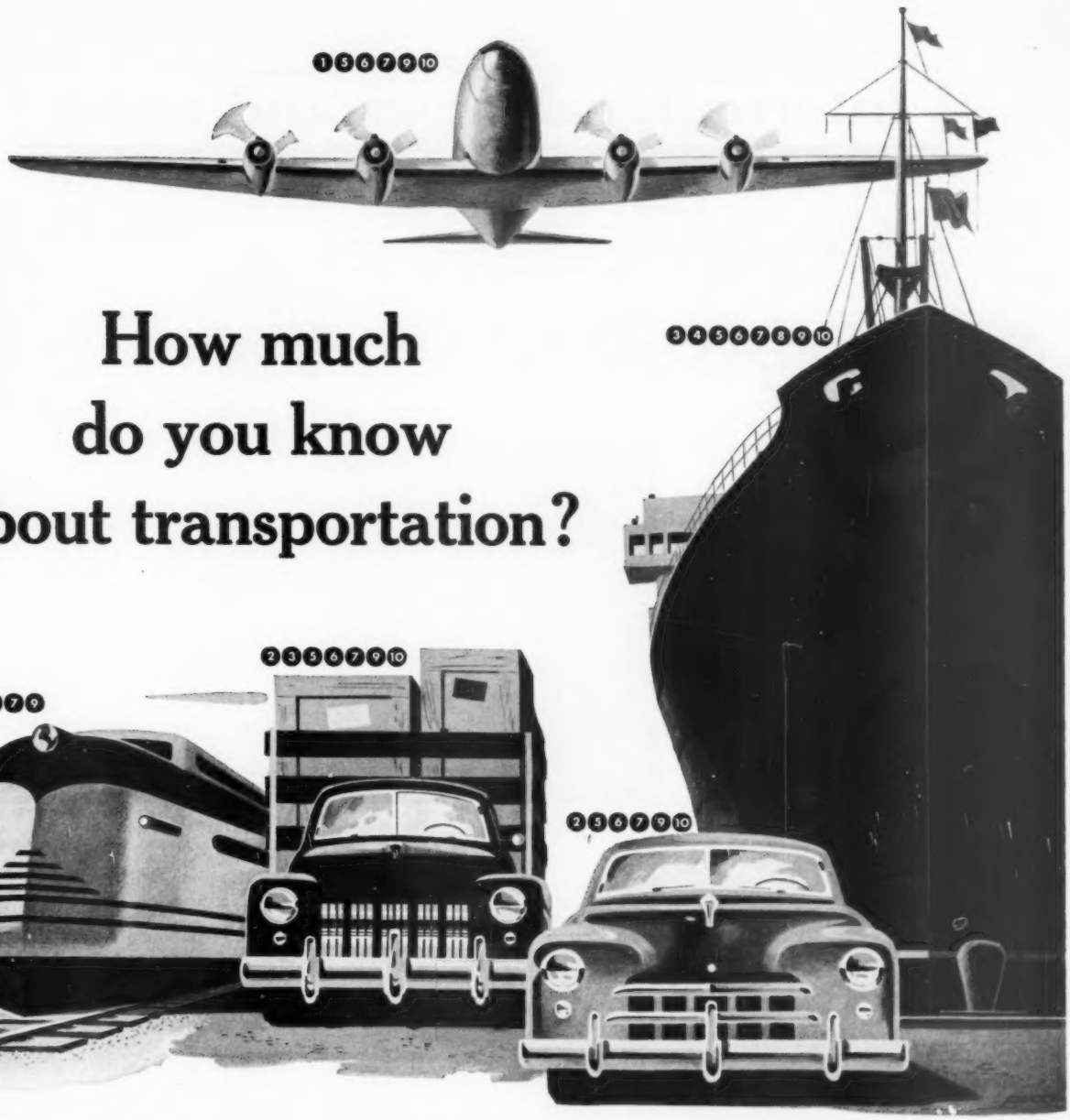
(1) The million-ton yearly plant under construction at Rho (Milan) by the Condor Refining Co. of Rome. It is to be connected to the port of Genoa by a 160-kilometer pipe line which is to be operated in conjunction with the Permolio Co.

(2) The plant of Industrie Raffinazione Olii Minerali (IROM) also with a yearly capacity of a million tons, being constructed by the Anglo Iranian Oil Co. together with the Azienda Generale Italiana Petroli (AGIP) to replace the old AGIP refinery at Venice Marghera damaged during the war by air raids.

(3) The 300,000-ton crude oil capacity plant under construction at Mantova by the Italian subsidiary of the French Omnium des Petroles.

Aside from the above are the San Giorgio di Trecate (Novara) 2,000,000-ton crude oil processing plant projected by the Petrolcaltex (Caltex and Fiat Co.) which is to be connected to the port of Vado Ligure (Savona) by a 170-kilometer pipe line, and the project of the Azienda Generale Italiana Petroli to build a new refinery in Sicily or in Sardinia where refined products must now be imported from northern Italy or from the Italian Adriatic Coast (Bari) though recently the demand for bunkers at Sicilian ports has greatly increased.

From present indications it appears certain that the demand for petroleum products in Italy will increase rapidly in the next few years. Motor transport has made noteworthy progress in the course of the past few years and the number of motor vehicles is now about double what it was ten years ago. Moreover, the Italian government has laid out an extensive program of highway construction including motor roads between Turin and Venice, Turin and Savona, Milan and Genoa, Leghorn and the Brennero and Brindisi, Taranto and Beggio Calabria. In addition there is room for great expansion in the use of tractors. In southern Italy there is one tractor to each 2,050 acres against one tractor for each 85 acres in Great Britain. Taking into account the credit facilities which the government has provided for farmers in southern Italy great progress should be made in the motorization of Italian agriculture. Under these circumstances it is possible that the output of the refineries which have been completed and which are under construction might even be less than the demand for oil products in the course of the next decade.



How much do you know about transportation?

Nearly all of the rapid, modern transportation by land, sea and air depends on petroleum for power and lubrication. But few realize the wide variety of petroleum products required to keep travel and trade in motion. Test your own knowledge.

At right are listed a few of the many petroleum products needed. See how many of them you can correctly identify with the mode of transportation in which they are used. Then check your estimates with the figures in the illustration.

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4. Bunker Fuel Oils
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7. Synthetic Rubber
8. Steam Turbine Oils
9. Gear Lubricants
10. Hydraulic Oils

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International news and notes

Diesel Electric Barge

Shell Petroleum Co. Ltd. has recently awarded a contract to Ferguson Brothers (Port Glasgow) Ltd. for the construction and fitting out of an all welded steel barge, approximately 158 x 80 x 10 feet, for use in connection with marine oil well drilling operations in Venezuela. This vessel, which is non-propelling, is virtually a floating power station — which accounts for the large beam. The diesel electric machinery installation will have a combined B.H.P. of over 4,000.

Progress At Fawley

The peak period of construction in the building of Europe's largest oil refinery at Fawley, Hampshire, by the Anglo-American Oil Co., has now been reached and over 4,000 men are at present engaged on the project. The crew includes more than 700 pipe fitters and helpers, over 300 welders, nearly 500 carpenters, 150 boilermakers. Several of the main refinery units are now structurally completed. In order to ensure progress is not interrupted because of the shorter winter days, the entire project will be floodlit during working hours of dusk and darkness.

"Eurotank" Refinery Reopened

The reconstructed "Eurotank" refinery at Hamburg, which was acquired by the Anglo-Iranian Oil Co. in 1948, was formally reopened on Sept. 26 last.

Originally built by a German company in 1934, it was almost destroyed during the war, but was restored to limited use in Feb. 1949 to provide products for the German marketing company of the Anglo-Iranian group. Its rehabilitation, giving a crude capacity of 575,000 tons a year, has now been completed.

The reopening was marked by a program of entertainment which began on Sept. 25 when 200 guests were invited to a civic reception given by Herr Brauer, the Mayor of Hamburg, followed by a dinner at the Hotel Esplanade. During the plant visit F. G. C. Morris, a managing director of the Anglo-Iranian Oil Co. and chairman of BP Benzin U. Petroleum G.m.b.H. (the new name of the Anglo-Iranian company in Germany, formerly called "Olex" which now operates both the refinery and distributing organization) expressed thanks to all staff and to the authorities who had cooperated in the completion of the new refinery.

J. Ornstein, Managing Director of BP Benzin U. Petroleum

Guests inspecting Eurotank refinery.

Takes Post In Mexico

Harry J. Burns has been appointed engineer in Mexico for the Perco Division of Phillips Petroleum Co. He will represent Perco licensing and engineering services in the various refineries of Petroleos Mexicanos. Mr. Burns joined the refining department of Phillips in 1932, and progressed to superintendent of manufacturing at the Phillips Kansas City, Kansas, refinery. In September 1945, Burns transferred to Mexico City as Phillips operation supervisor under the Phillips petroleum supervisory contract with the Mexican government. The new Perco office is located at Dolores #3, Mexico, D.F.

First Iraq Pipe At Tripoli

The first shipment of pipe for the 30-inch pipe line, which will treble current deliveries of Kirkuk crude oil to the Mediterranean, has arrived at Tripoli. The line, which will have a capacity of 13-million tons per annum, will connect the Kirkuk oil field in Northern Iraq with the Mediterranean seaboard at Banias. It will be 560 miles long and will require 145,000 tons of 30/32-inch pipe, and 23,000 tons of 26-inch pipe.

Arrangements have been made to charter 42 vessels for shipping the pipe from the United States to the Mediterranean port of Tripoli (Lebanon) and to Basrah in the Persian Gulf. To convey it to site from these ports will involve 25-million ton-miles of motor transport across the Iraq and Syrian desert.

Laying of the pipe has now commenced and is due for completion in 1952. The pipe has been ordered from the Consolidated Western Steel Corp. of Los Angeles, and the National Tube Co. of Lorain, Ohio, as there is inadequate European capacity for 30-inch pipe. Pump station and other ancillary equipment has been ordered in the United Kingdom.

The cargo of pipe which arrived at Tripoli on S.S. "Ixia" on Nov. 5, sailed from Baltimore on Oct. 14 and consists of 3,224 tons, or 13.4 miles of 26-inch pipe. It will be used for the downhill gradients from the saddle of the Homs Gap to the sea coast at Banias. The remainder of the line will consist of 30 or 32-inch pipe, in approximately equal proportions, and it has been so ordered to permit nesting of the 30-inch inside the 32-inch pipe for shipment. The first cargo of 30/32-inch pipe sailed on the "Middlesex Trader" from Los Angeles on Sept. 30 and arrived at Basrah on Nov. 15.

Preparations for expanding the production of the Kirkuk field from the 1950 level of six-million tons are well in hand, and when the new line is complete in 1953, over 18-million tons per annum of Iraq crude oil will flow to the Mediterranean, for the markets of Western Europe.

Orders Two Tankers

Standard Oil Co. (NJ) has ordered two 26,500 ton deadweight tankers from Vickers-Armstrongs Ltd. The two vessels costing more than $7-million will be constructed at Vickers' shipyard at Barrow-in-Furness. The order will aid the Jersey company in using its sterling balance. These new tankers will probably be engaged in bringing crude from Middle East sources to the new $100-million Esso refinery at Fawley. The principal dimensions of the tankers will be 628 feet overall length, 600 feet between perpendiculars, 82.5 feet moulded breadth and 42.5 depth with summer draft of 31 feet, 11 inches. The propelling machinery will consist of a reduction gear turbine of 12,500 shaft horse power, driving a single screw. The designed speed will be 17 knots.

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Fractionating Towers For Stanlow

One of the problems attending the construction of modern petroleum refineries is that of transporting the huge towers that are an essential part of these plants. Present day highways, even those of most modern type, were not designed to accommodate vessels of such size and special provisions have to be made for moving them. The accompanying illustration shows a picture of one of the largest fractionating towers ever fabricated approaching its destination at the Stanlow refinery of the Shell Refining and Marketing Co. Ltd. after a journey of 225 miles from the Renfrew Works of Babcock and Wilcox Ltd. where it was built to the order of The Lummus Co.

Owing to Ministry of Transport regulation it was impossible to convey the huge column in one piece, and it was therefore manufactured in three sections. The passage of the largest portion through the towns en route was undertaken at night, to minimize interference with normal traffic. The picture therefore shows only the top section, 81 feet long, 11 feet three inches in diameter and weighing nearly 100 tons, hauled by two 180-hp tractors on 16-wheeled bogies at a maximum speed of five miles per hour. The journey occupied ten days and included passage through the Mersey Tunnel.

Transport successfully completed, the Renfrew specialists of Babcock & Wilcox Ltd. are now engaged in the task of welding the three sections together at site into a column 148 feet long and weighing 156 tons. After welding has been completed, and before the giant tower is erected to its final vertical position, a detailed X-ray examination will be undertaken, followed by stress relieving. This involves the building of a special furnace inside the column and the lagging of the exterior to maintain the desired temperature.

Incidentally, it may be mentioned that the fractionator pictured will not be the tallest of the columns at Stanlow. Two others are in process of manufacture at Renfrew, the larger of which will be 169 feet in height, weighing 200 tons.

Kellogg Opens Canadian Piping Shop

Canadian Kellogg Ltd., has started operations in a new pipe fabricating shop in Edmonton, Alberta. The shop was opened to service the rapidly expanding requirements for power and process piping in western Canada. Having an approximate monthly capacity of 400 tons, the shop is equipped to fabricate specialty materials such as stainless steel and high nickel alloys in a full range of pipe sizes.

Recent Visitors to Mexico

So many American oil men have been visiting Mexico recently it looked like a convention although the arrivals invariably insisted they were simply on a "pleasure trip." Among those noted were Ben Morgen and family of Bogota, Colombia; A. E. Roger of Beaumont, Texas, and wife; George Ets of the Antonio Oil Co., Lubbock, Texas; J. E. Cummins of Tampico, Mexico; R. C. Fain of Fort Worth; R. E. Lee and family of El Segundo, Calif.;- W. M. Summers of Wichita Falls, Texas; Richard Paris of Jatum, New Mexico; James R. Cameron of Los Angeles; V. P. Winder of Humble Oil & Refining Co., Houston; Joseph G. Davidson of New Orleans; E. B. Koch of the Quaker State Oil Refining Corp., Dallas; A. J. Bittner of Standard Oil Co. of N. J., Baton Rouge, La., and wife; Roy Butler of Austin, Texas and wife; Swanton D. Dalton of the Socony-Vacuum Oil Co., New York City; George MacLeod of Corpus Christi, Texas; Alfred T. Smissen of Oklahoma City; David Bruton of Houston; Wendell Cox of Tampico; H. W. McCleary of Los Angeles; Allan Guiberson of Dallas; Fred Briggs Jr., of the Texas Co., New York City; W. B. Harding of the Gulf Oil Co., Houston; Fred M. Hill of the Pasadena Oil Co., Calif. J. V. Brazier of Tulsa, Okla.; W. S. Key of Oklahoma City; J. J. Ploga of Galveston, Texas, and wife; Bill Breton of the Socony-Vacuum Oil Co., Guadalajara, Mexico; A. L. Cashmann, of Tulsa, and wife; Vance T. Moore of the Texas Co., Houston; P. L. Farley also of Houston; W. R. Rossell and E. William of West Columbus, Texas; M. D. Gilchrist of the Universal Oil Products Co., Chicago; Ray Brinkley of Tulsa and wife, and Howard Ballaris of the Shell Oil Co., Modesto, Calif. But the big man of Mexican oil production, Pemex director Antonio J. Bermudez, was not here to greet them having reversed the trend by going to New York City.

Kirkuk and Qatar Production

Production of crude from the Kirkuk field of Iraq Petroleum Co. Ltd. during September 1950 amounted to 603,166 long tons or 150,792 barrels per day. Output of Qatar for the same month was 143,113 long tons, approximately 35,776 barrels daily.

To Train Mexican Oil Men

Mexico is building a Petroleum Institute to train technicians for its oil industry, it was announced by Enrique Huidobro and Javier Chavez, officials of the Mexican Oil Workers Union. The Institute is expected to receive its first class of 2,000 students on September 1, 1951. Buildings costing $1,156,069 occupy a 39½-acre campus between Ciudad Madero and Tampico in the State of Tamaulipas. The expenses of constructing the Institute are being borne equally by the Education Ministry, Petroleos Mexicanos and the Oil Workers Union. Faculty is limited to Mexicans.

Pemex Buys Phillips Claims

Petroleos Mexicanos has acquired all leases, rights, lands and royalty claims of the Abraham Z. Phillips family for $2,500,000, it was announced by Antonio J. Bermudez, Pemex director. Payments for the property, which includes the rich Mecatepec, Escolin, Poza Rica and Presidente Aleman fields, will be made in 25 monthly installments until the full amount is covered, Bermudez said. The Phillips holdings were the largest owned by any individual in Mexico.

International Petroleum Consultants Ltd.

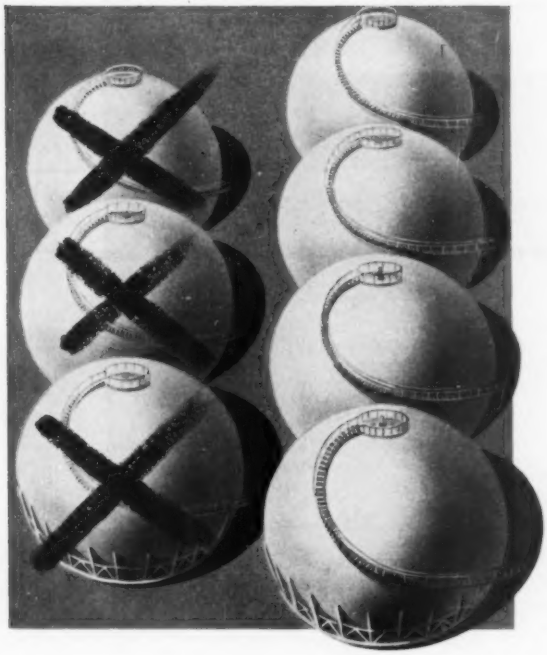
A consulting organization of exceptionally broad scope has been formed in Pasadena, Calif., under the name of International Petroleum Consultants, Ltd., with headquarters in the Petroleum Consultants Building, 709-11 South Fair Oaks Ave. It brings together men of recognized position in the specialized fields of geology, surface and sub-surface petroleum engineering, petroleum chemistry, geochemistry and economics to provide a complete geological, engineering and management service for the petroleum industry throughout the world.

The principal figure back of the founding of International Petroleum Consultants, Ltd. is Florent Houlding Bailly, long a well-known geologist and petroleum engineer in Venezuela. A graduate of California Institute of Technology, he brings to the organization the advantage of broad field experience as well as technical knowledge. He was made president of Pantepec Oil Co. of Venezuela and its companion company, Pancoastal Oil Co., C. A. of Venezuela in 1949. Mr. Bailly also organized four service companies which are under the technical direction of the International Petroleum Consultants organization. These are Petroleum Engineering Associates and Oil Properties Consultants of Pasadena, Calif.; Petroleum Industry Consultants, C. A., Caracas, Venezuela and Geological Engineering Consultants of Cuba. Their operations cover a wide range of engineering, geologic, economic and laboratory services including differential thermal analysis, radioactivity measurements, relative permeability measurements, P.V.T. relationships of oil and gas, etc.

In addition to Mr. Bailly, the other members of International Petroleum Consultants include: John F. Dodge, petroleum engineer and consultant and past chairman of the Division of Petroleum Engineering at University of Southern California; Dr. René Engel, Ph. D. (California Institute of Technology 1933) Chemical Engineer (University of Paris 1909), past Curator of Mineralogy and Petrology Los Angeles County Museum, Calif., consulting geologist, geochemist and engineer; Dr. Hans E. Thalmann, Ph. D. in geology (University of Berne, Switzerland, 1922), petroleum geologist, stratigrapher and micropaleontologist; Charles R. Dodson, professor of Petroleum Engineering at the University of Southern California, and James B. Christie, engineer and patent counsel of Pasadena, Calif.

Enlargement of the Petroleum Consultants Building in Pasadena is under way including the construction of a new two-story and full basement addition. The completed building is to house the expanding laboratories of Petroleum Engineering Associates, the engineering and geological offices of Oil Properties Consultants, Inc. and offices and consulting quarters for the members of International Petroleum Consultants, Ltd. Facilities for the extensive technical library of the organization will be incorporated in this new structure.

Left to right: James B. Christie, Dr. René Engel, Charles R. Dodson, Florent H. Bailly, John F. Dodge and Dr. Hans E. Thalman.



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Oil company staff changes

R. Ogarrio

R. Ogarrio Retires

R. Ogarrio has resigned as vice president and director of The Texas Co., and will retire on Dec. 31, 1950. At that time Mr. Ogarrio will have completed 34 years of service with the company, which began in 1916 in Mexico. In 1925 he was appointed general manager of The Texas Petroleum Co., operating in Colombia and Venezuela. In 1928 he was elected vice president in charge of production, and in 1931 he was elected to the board of directors. Mr. Ogarrio has established his residence in Mexico and will continue in a consulting and advisory capacity primarily on the company's foreign activities.

ROY J. DIWOKY, executive vice president of Pan-Am Southern Corporation, will take over the duties of Bruce K. Brown as President of Pan-Am during Mr. Brown's absence. Mr. Brown is expected to be in Washington for at least a year, serving under Secretary of the Interior, Oscar L. Chapman. Mr. Diwoky, formerly of Standard Oil Co. (Ind.), was appointed executive assistant to President Brown in June 1949 and was recently made executive vice president. He joined Indiana in 1935 and he rose to the position of assistant general superintendent of the Whiting refinery.

JOHN W. B. FORINGER has been appointed director of industrial relations of Lion Oil Co. He has engaged in the general practice of law, usually connected with oil, and has dealt with labor and personnel problems for a number of companies including United States Steel Corp. subsidiaries.

P. K. KUHNE, assistant to the general manager, manufacturing department of the Gulf Oil Corp., has been given the added assignment of assisting in the administration of the technical division of the department. He joined Gulf as an assistant chemist in the Port Arthur Refinery in 1927 and became assistant to the general manager of the manufacturing department in 1941. He served on numerous PAW Committees during the war and was a member of the SHAEF sponsored Technical Oil Mission to Germany with the honorary rank of colonel.

HOWARD COOPER, manager of technical service for the Sinclair Refining Co., has been elected president of the National Lubricating Grease Institute. A director since 1945, he was elected vice president of the N.L.G.I. at last year's annual meeting. Mr. Cooper joined Sinclair in 1923 and since that time has held the positions of lubricating engineer, assistant manager of lubricating sales, chief lubrication engineer and currently, manager of technical service. He served in the PAW during World War II as section chief in the marketing division.

G. E. Merkle, vice president of Fiske Brothers Refining Co., Newark, N. J. was elected vice president of the institute. C. B. Karns, Esso Standard Oil Co. was re-elected treasurer.

FREDERICK M. SMITH has been appointed organic chemist for Deep Rock Oil Corp. He is recognized as an authority in petroleum chemistry and specializes in alkylation of aromatics, chromotography, isomerization, detergents and oxidation of hydrocarbons. Mr. Smith has been with Phillips Petroleum Co. for the past six years.

J. F. LANTHRIP has been promoted from chief of the budget section to assistant treasurer in the Tulsa office of British American Oil Products Co. it is announced by Treasurer F. G. O'Brien. His advancement follows the transfer of D. W. Holder to the Calgary, Canada, office of the company. Mr. Lanthrip, better known to his associates as "Cotton", joined British American as a clerk in 1937 and has been with the company since that time except for his service from 1942 to 1946 in the Army Air Corps where he attained the rank of Captain.

J. W. PEGG has been named vice president of Shell Development Co. He will be in charge of the New York offices which handle licensing of patented processes, development of markets, and serve as technical liaison between government agencies and Shell Development's main office and laboratories at Emeryville, Calif. Mr. Pegg joined Shell in 1937 as an attorney and became executive assistant to the marketing vice president in 1945. He became manager of Shell Development's New York office in 1949.

J. W. Pegg

Milton S. Beringer

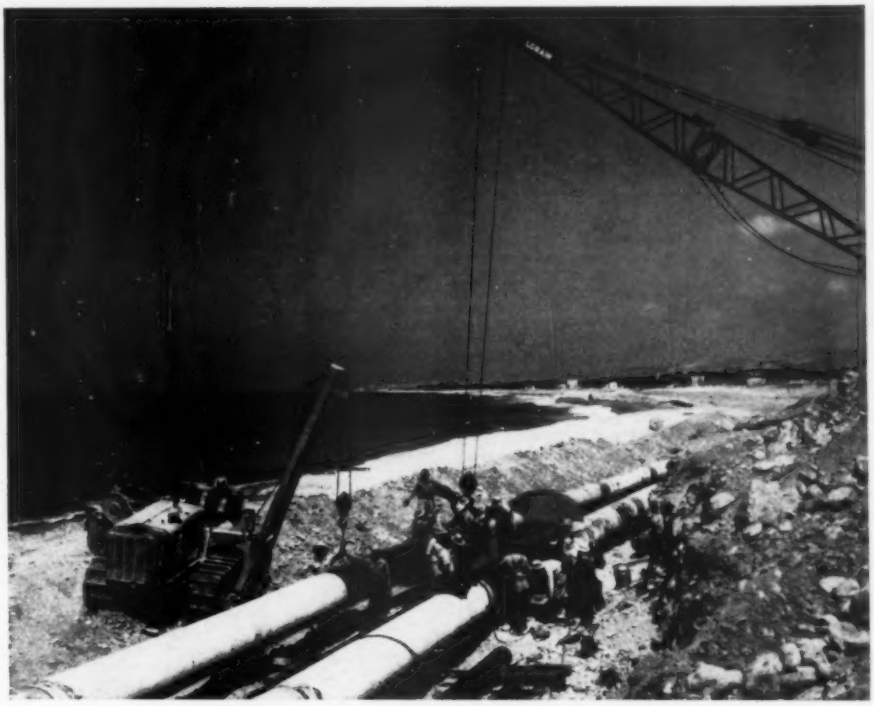
Elected British-American Director

Milton S. Beringer, vice president in charge of manufacturing, has been elected a director of The British American Oil Co. Ltd. Since joining British-American in 1934 as a refinery superintendent, Mr. Beringer has built several major refineries including those at Moose Jaw, Calgary and Clarkson. He directed the recently completed expansion at Montreal East Refinery and, under his direction a new plant is being built at Edmonton and the existing refinery at Moose Jaw is being expanded.

In his early years in the petroleum industry, Mr. Beringer was engaged in refinery operations for several U. S. companies and also worked as supervising engineer on two refinery construction projects at Ploesti, Roumania. Mr. Beringer has been superintendent of B-A's Turner Valley absorption plant and Calgary refinery. He was appointed manager of refineries in 1945 and later the same year assumed his present position of vice president in charge of manufacturing.

J. G. CHRISTOPHER has retired from Socony-Vacuum Oil Co., Inc., after 40 years' association with the company. He was eastern railroads sales representative in the national accounts department. He is succeeded by M. G. DeForest, who has been acting sales engineer for railroads. G. A. Hope of the gasoline and fuel oil department succeeds Mr. DeForest.

PAUL E. KUHL, who has been serving as assistant general manager of East Coast manufacturing, has begun a one-year period as assistant general manager of Esso Standard Oil Company's overall manufacturing operations. The position, a newly created one, was established as a part of the company's management development program. Present plans provide that the job will be filled on a rotational basis. Mr. Kuhl has been with Esso since 1926. He went to Aruba as assistant superintendent of the refinery there in 1932. Subsequently he was assistant manager and then associate manager of the Standard Oil Development Company's process division. He became assistant manager of the Southern East Coast units in 1944, manager in 1945. He moved to New York in March, 1948.



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Backrach

Robert J. Carter

Stone and Webster Appointment

Stone & Webster Engineering Corp. has appointed Robert Jefferson Carter as southwestern district manager with offices in the Esperson Building, Houston, Texas. He succeeds A. T. Krook who recently was elected president of Stone & Webster Canada Ltd. after nine years as manager of the Houston office.

After fifteen years of engineering experience in the petroleum industry, Mr. Carter joined the Stone & Webster organization late in 1939 and since then has been associated with some of their most important projects in the petroleum field. Since Feb. 1948, he has been assistant chief process engineer and in August of this year, he returned from England where he had been engaged for two years on the engineering phases of a large chemical project under construction in Scotland.

Charles L. Lockhart

Charles L. Lockhart, manager of Shell Oil Company's Sewaren, New Jersey marine terminal, died Saturday morning, Dec. 2, at Grace Hospital in Detroit. He was 57. Mr. Lockhart was stricken while visiting his son. Mr. Lockhart joined Shell in 1928 and has served in several of Shell's marketing divisions.

Coons Elected a Rheem Director

Clifford V. Coons, vice president in charge of sales for Rheem Manufacturing Co., has been elected a director. Mr. Coons fills a new position on the Rheem board, created by an increase in the number of directors from seven to eight. Mr. Coons moved to Rheem's New York offices in 1940 as container sales manager, and was named general sales manager soon thereafter.

Clifford V. Coons

R. C. FREDERICK has been appointed chief of the gas supply and disposition branch of the production department staff of Gulf Oil Corp. in Pittsburgh. He joined Gulf at Tulsa in 1927, and until his new appointment was staff assistant to P. H. Bohart, vice president. Carl J. Maki has been appointed assistant to Mr. Frederick. He was originally employed by the Mene Grande Oil Co. in 1945 to form the gas department, and has served in the capacity of superintendent of that department in eastern Venezuela until his new appointment.

DON EMERY has resigned as a member of the executive committee and as vice president and general counsel of Phillips Petroleum Co. to enter the private practice of law in Oklahoma City. He will continue to serve as a director of Phillips and director of American Independent Oil Co. Mr. Emery has been an employee of the company for over a quarter of a century and a director and officer since January 1, 1938.

Rayburn L. Foster, assistant general counsel, was elected vice president and general counsel to succeed Mr. Emery. Mr. Foster has over 22 years continuous service with the company.

DR. BERNARD H. SHOEMAKER of Whiting, Ind., divisional director of research of the Standard Oil Co. (Ind.), has been elected chairman of the American Chemical Society's Division of Petroleum Chemistry. He succeeds Dr. A. A. O'Kelly, technical director of the Alox Corp., Niagara Falls, N. Y.

Dr. F. E. Frey, assistant director of research of the Phillips Petroleum Co., Bartlesville, Okla., was named chairman-elect and Dr. C. G. Kirkbride, vice president of the Houdry Process Corp., Marcus Hook, Pa., was re-elected secretary-treasurer.

E. B. STEWART has been appointed manager of a newly-formed production district at Sidney, Neb. for Ohio Oil Co. The new district embraces Ohio's new discoveries in western Nebraska and includes also northeast Colorado and southern South Dakota. Mr. Stewart formerly was division superintendent at Tulsa. He is succeeded there by R. C. Farley who was transferred from Findlay, Ohio, general offices, where he has been assistant to the general superintendent, R. W. McCanne, formerly assistant to the manager of production at Findlay has been transferred to Casper, Wyo., as assistant manager.

L. M. SWAYZE, who has been active as an independent oil lease broker in the Southwest since 1942, was appointed assistant to Deep Rock Oil Corporation's land manager F. E. Swenson. Mr. Swayze came to Tulsa first in 1919 and entered land and lease work in Arkansas just before the Eldorado field was discovered.

Temple W. Tutwiler

Temple W. Tutwiler, 71, a director of Cities Service Co. and a member of its executive committee, and its chief engineer, died Nov. 9 at his home in Birmingham, Ala., after an extended illness. In 1930 he became a director of Cities Service and in 1936 an executive. During World War II he expedited the construction of the company's new refinery at Lake Charles, La. For this achievement, Mr. Tutwiler was honored by having the plant named after him.

Albert LeRoy Ellsworth

Albert LeRoy Ellsworth, 74, died November 28 after a long illness. Mr. Ellsworth was chairman of the British-American Oil Co. Ltd. which he founded in 1906 and developed into Canada's largest independent oil company. He founded the British-American Oil Producing Co. in 1925 with the first production in the Wichita Falls, Texas area. Later, more extensive properties were developed at Bristow and Oklahoma City. British-American now has developed production in twelve states. In addition to activities of the producing company, he organized The Toronto Pipe Line Co. with operations in four states. Failing health had forced Mr. Ellsworth's withdrawal from active participation in the company for several years prior to his death but he maintained a keen interest in its affairs.

H. Gottwald

Rockwell Makes Gottwald Ass't V.P.

L. A. Dixon, vice president of Rockwell Manufacturing Co., has announced the appointment of H. Gottwald as assistant vice president of the Nordstrom valve division of the company. Previously he was assistant vice president of the company's meter and valve division. For the past year he has been assistant sales manager of Rockwell International Corp. and in that capacity traveled extensively throughout all of the Western Hemisphere.

Heads Graver Construction

R. A. Fox has been appointed manager of the Graver Construction Co. both for all American projects and for all the company's overseas operations. He will direct the company's offices in New York, Chicago and Houston and supervise an engineering division in Jersey City, N. J. Announcement of this appointment was made by Mr. E. N. Gosselin, president of the parent firm, the Graver Tank and Manufacturing Co., Inc., from its East Chicago headquarters.

Mr. Fox formerly served as field assistant to the late E. B. Heyden. He has a broad and varied background of experience in engineering and construction. He first was employed as engineer for Winkler Koch Engineering Co. and then by Sinclair Refining Co. as a designer in Houston. He has been in charge of planning, construction and operation of several refineries. He was chief engineer for plant enlargement at the Derby Oil Co. in Wichita and later construction engineer for new work at Shell's Wood River refinery.

For ten years he was chief engineer for the Globe Oil & Refining Co. at Lemont, where he also had charge of all engineering, purchasing and construction personnel. He has served as consulting engineer, both for himself and for the Koch Engineering Co.

R. A. Fox

Power by Westinghouse for the world's most unusual oil field!
The 430 wells of the Mene Grande Company in Lake Maracaibo produce 60,000 barrels of oil every day. Mene Grande—the world's most unusual oil field lies completely under water, while every pole of the power line (once it leaves the Westinghouse-equipped power plant at Las Marochas) as well as the secondary substation and transformer banks are located completely over water. Despite the special problems involved in operating this unique power system, 60,000 barrels of oil are produced 24 hours a day, month in and month out. 500 Westinghouse motors help pump it to gathering stations, treating plants and storage tanks.
This installation is typical of Westinghouse engineering skill and equipment at work in the world's largest oil fields and refineries.
Four Westinghouse turbine-generators installed at Las Marochas power plant. The two units in the foreground are rated 6250 KVA; the two in the background, 3125 KVA.
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D. E. BURROUGHS, vice president of the American Credit Association and general credit manager of Shell Oil Co., New York, was elected president of the organization at its recent annual meeting at Cleveland. He succeeds Arch E. Fletcher, conference chairman, who is general credit manager of the Standard Oil Co. (Ohio). J. A. Walker, general credit manager of the Standard Oil Co. of Calif. was elected vice president. Regional vice presidents elected were E. P. Simmons, Magnolia Petroleum Co., Dallas; R. W. Weiler, The Texas Co., New York; and W. M. Smith, Standard Oil Co. (Ind.), Chicago.

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New Book

The Science of Petroleum, Volume V, Part I, Crude Oils, their chemical and physical properties, edited by Benjamin T. Brooks and A. E. Dunston, published 1950 by Oxford University Press; 200 large pages, £4.4s.0d net.

In 1938 the Oxford University Press published four of a series of books intended to bring together the world's scattered data on the science and technology of petroleum. They have now got around to produce the final volumes on crude oils in three parts, of which Part I is now out and consists of two sections. The first section lists the principal oil fields of the United States, Venezuela and the Middle East, and gives an extended discussion of the evaluation and economics of production and distribution of petroleum products. The second section consists of seven papers by outstanding authorities on the hydrocarbons in petroleum; the chemistry of paraffins, naphthenes, aromatics, olefines and diolefines, the mechanism of organic reactions, the analysis of petroleums, the chemical thermodynamic properties of hydrocarbons and high-pressure vapor-liquid equilibria in cycling operations. It is a good book for researchers in petroleum chemistry. Orders may be placed with the WORLD PETROLEUM book department at either New York or London. The U. S. price is $11.00 postpaid.

Oil Reservoir Engineering

Elements of Oil Reservoir Engineering, by Sylvain J. Pirson; published 1950 by McGraw-Hill Book Co., New York; 441 pages, $6.50.

This is a text book at the graduate level for petroleum engineers. The author develops and coordinates the principles which govern behavior of oil reservoirs when placed under protection during their primary phase, and in secondary recovery operations. Recent advances in the methods of testing the properties of reservoir rocks and fluids are covered, with good emphasis on fundamental equations and the all-important electric-log interpretations. The subject is plentifully illustrated by practical problems.

This book may be purchased through the World Petroleum Book Department, 2 W. 45th St., N. Y. 19.

New Tank Roof Design

Graver Tank & Mfg. Co., Inc., has recently introduced a center-weighted floating roof to combine the vapor-saving and corrosion-resistant features of the double-deck floating roof with the more economical aspects of the conventional pan-type floating roof. The roof is a low-angle, inverted flexible cone which, floating on top of the petroleum product in the tank, gains stability by the weighted pressure of the cone in the liquid. The turret in the center is loaded with sand, concrete, or other material as required. Pipe supports are needed only at the center and rim. Drainage is accomplished from the depressed center of the roof—the apex of the inverted cone—through a sump connected by a pipe or hose with the outside of the tank at ground level.

The Oil Record—1950

The Oil Record, 1950, published by Petroleum Industry Projects, under the direction of Henry Ozanne, 251 pp. $4 net.

This new handbook presents data on more than 100 domestic oil companies in the United States under the headings of management, history, subsidiaries, scope of operations, capital structure and financial data. Natural gas companies are not included but will be treated in a subsequent book. Highlights of the industry for the current year are briefly presented including a chapter on oil and Washington. Principal trade and technical organizations are listed at the close of the volume. Copies are available through the book department of **World Petroleum.**

Marine Turbines

Installation of eight General Electric DP mechanical-drive turbines on each of five new tankers marks the first marine use of these standardized turbines. The 28,000-ton Standard Oil Company of California tankers, of which the SS T. S. Peterson is the first completed ship, are being built at the Sparrows Point, Md., yard of Bethlehem Steel. The turbines are used to power the carbo pumps, the main boiler feed pumps and the fire pumps and Butterworth system.

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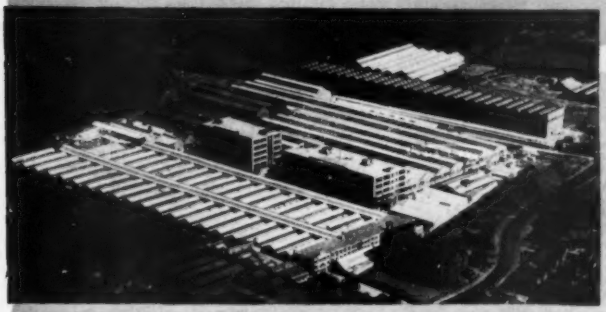
Steam, Diesel or Motor-Driven Pumps, Reciprocal and Centrifugal types, for all refinery duties; Heat Exchangers; Air Compressors; and all power plant auxiliaries for Boiler Feeding and Feed Heating. Write for Catalogue Section IL.81 "Weir Pumps for the Oil Industry."

G. & J. WEIR LTD.
CATHCART : GLASGOW

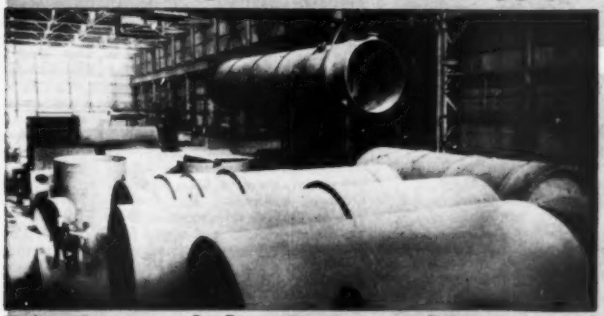
There is a wide gap, measured in terms of both time and distance, between a drawing-board in Britain and an oilfield in Venezuela.



Harvey's Works

where the plans are laid,

In the immediate Postwar period, there was a gap, just as vast, between the production and supply of plant for the growing Oil Industry.



the parts assembled,

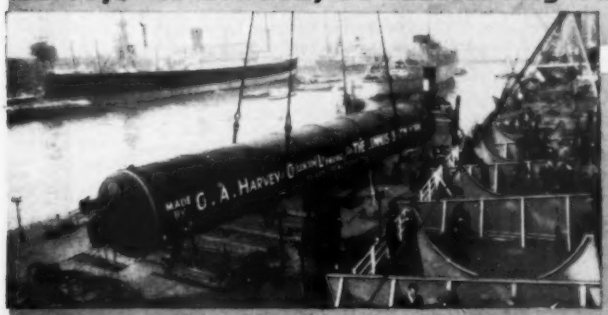
& the welding x-rayed.

But the need for Refinery Plant had been foreseen by Harveys of London; they instantly harnessed all the huge resources of their organisation

The column is transported,

with minor incidents,

and, by doing so, reaped the reward of their foresight and enterprise. Harveys of London, in fabricating such items as Fractionating Columns,



to be loaded at London Docks

& off-loaded off Venezuela.

are triumphantly meeting the urgent needs of Oil Producers and Refiners.

These Fabrication and Transport scenes are, in part, taken from a Shell series covering the whole operation of producing Oil Plant.

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Consolidates Rubber Plants

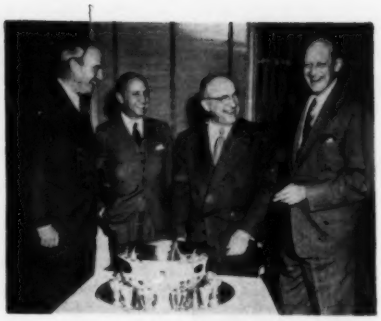
Phillips Chemical Co. has taken over operations of the government-owned synthetic rubber plant, near Borger, Texas, and will operate it as a unit with the adjoining Plains butadiene plant, which produces more than 50,000 tons of butadiene yearly. W. C. Hewitt is plant manager of the combined plants, and G. H. Short, manufacturing superintendent.

Book Review

Petroleum Production Engineering: Petroleum Production Economics, by Lester Charles Uren; published 1950 by McGraw-Hill Book Co., New York; 639 pages; $7.50. May be ordered through World Petroleum Book Department.

The third volume by this well known authority on the engineering of petroleum production is concerned with the economics of this product. Naturally the petroleum engineer should not only be competent to produce oil, but also he should have a good acquaintance with the economic conditions under which oil is produced and distributed; he should have more than a superficial knowledge of the principles of business administration as they apply specifically to the petroleum producing industry. These include such things as economic geography of petroleum, oil and gas land acquisition, labor management, taxation, cost accounting, conservation, oil and gas property appraisals, etc. All of these are often of relatively more importance than the actual engineering design and construction. Professor Uren shows that his competence in these matters is on a par with his known qualifications in the production aspects of the oil industry.

C. H. MIMS, United Geophysical Co., party chief, moved to the middle east area to head a new seismic party commencing operations in December.



Marion W. Boyer, who resigned from Esso Standard Oil Co. after 23 years to become general manager with the U. S. Atomic Energy Commission, received the congratulations of colleagues at a party given in his honor on November 3. He was presented with a silver punch bowl set. Shown left to right are: H. G. Burks, Jr., executive vice president of Esso; William Naden, Esso vice president; Mr. Boyer and M. J. Rathbone, Standard Oil Co. (NJ) director.

Brazil to Train Oilmen

An agreement has been signed between the Brazilian University and the National Petroleum Council to train students in all branches of the oil industry. University courses will be organized in collaboration with the chair of chemistry and the Petroleum Council, the latter providing access to all its installations. Foreign professors and experts will be engaged and purses will be instituted to enable promising students to gain practical experience in Brazil and abroad. Candidates for the courses will be selected exclusively from chemists and engineers with degrees registered at the Ministry of Education.

Drilling Cost Manual

A complete revision of the manual of accounting practices and procedure for the oilwell drilling contractor and of the costing guide of items and materials used in oilwell drilling, has been published by American Association of Oilwell Drilling Contractors. Revision was carried out under the association's accounting committee, of which C. H. Todd, R. W. Rine Drilling Co., Wichita, Kansas, is chairman. The new manuals replace those originally published in 1945. Copies are available at a nominal cost through A.A.O.D.C. headquarters, 321 Reserve Loan Life Building, Dallas, Texas.

Heads ECA In Korea

C. E. Meyer, recently retired vice president and director of Standard-Vacuum Oil Co. has been appointed by the U. S. Economic Cooperation Administration as chief of its mission to Korea. He will supervise rehabilitation in the war-torn republic. Mr. Meyer has had more than 30 years of practical business experience in Asia. He held executive positions with Standard-Vacuum in Hong Kong, Foochow, Canton and Shanghai, and his responsibilities at one time or another covered all of China, including Manchuria. For the five-year period preceding World War II he was that company's general manager for Japan and Korea with headquarters at Yokohama.

Thrown into prison by the Japanese at the outbreak of war, Mr. Meyer was repatriated on the Grispsholm in August 1942 after six months of solitary confinement. He then served nearly two years as petroleum attache at the U. S. Embassy in London. He rejoined Standard-Vacuum in 1945 as a member of the board of directors, later being named a vice president. In these positions his responsibilities included all company operations in Japan, Korea, China, India, Southeast Asia and the Philippines. He retired last June, closing a 37-year career in the international oil industry.

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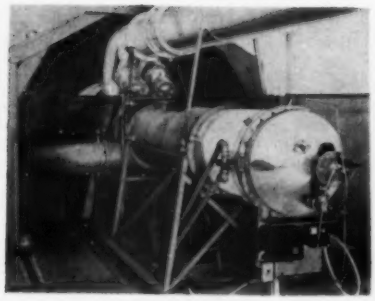

Supercharger Tester

A new development at The Cooper-Bessemer Corporation's Mt. Vernon, Ohio, plant permits complete performance tests of each exhaust-driven supercharger prior to installation on its engine. Heretofore, manufacturers' tests on such superchargers have been limited primarily to running the superchargers at top speed using steam. Now each supercharger is run under conditions of loads and temperatures well in excess of those on the engine for which it has been built.

In operation, air discharged from the supercharger's centrifugal compressor is directed through an oil fired combustion chamber. The heated air is then piped through the supercharger's gas turbine, driving in turn the same centrifugal compressor unit before being discharged into the atmosphere. Variations of load are determined by the amount of air discharged from the centrifugal compressor. Temperature is governed by the rate of combustion in the heating chamber.

New Welder

A new silicone-insulated, portable, a-c welder, equipped with automatic "Hot Start" control has been announced by the welding divisions of General Electric's apparatus department. Known as 6WK30J series it is one of the first standard a-c welder lines commercially available incorporating silicone insulation which is unaffected by high temperatures and is water repellent. The silicone used in this application is a product of the G-E Chemical Department, Pittsfield, Mass. Instant arc striking without any manual adjustment is provided by "Hot Start" automatic control.

New Book

Black Bonanza, by Frank J. Taylor and Earl M. Welty. Published 1950 by Whittlesey House, New York; 280 pages; $4.00.

This lively book is a chronicle of the career of Lyman Stewart, who was one of the founders and for a long time the indomitable head of the Union Oil Company of Calif. Stewart, a rugged and tenacious character, left the Pennsylvania oil fields where he had served a strenuous apprenticeship in the oil business, arrived in California in 1882 and until his death in 1921 his career was a succession of triumphs and near failures in the prolonged fight for control of California's largest oil enterprise. There is plenty of drama and suspense in the story, which Taylor and Welty unfold smoothly and exceedingly well. Many notable figures who played their parts in California oil history pass through these pages, which are illustrated by many photographs of men and scenes. The reader of this book, whether or not he has any interest in oil, will find the going anything but dull.

Alco Catalog

Alco Products Division of American Locomotive Co. has published a new 16-page catalog (AL-3) containing a fund of useful product information about heat exchangers, evaporators, feedwater heaters, pressure vessels and pipe. With 60-odd cutaway and sectional drawings the booklet is packed full of "how-it-works" information, and design and selection data. Copies are available from the Public Relations Department, American Locomotive Co., Schenectady, N. Y.

Dependable FIRE PROTECTION...

STARTS WITH ANSUL water-tight CONSTRUCTION

The new, improved Ansul Model "B" Extinguishers have the greatest fire-killing ratings* ever attained by hand portable fire extinguishers. In addition, WATER-TIGHT CONSTRUCTION, (exclusive with ANSUL) has resulted in far greater dependability than any other dry chemical extinguishers.

In fire protection equipment, the best is none too good. Accordingly, Ansul engineers conduct continuing research for improving Ansul Extinguishers and Dry Chemical. Ansul Quality has set a high standard for newcomers in the dry chemical fire extinguisher field. This unparalleled standard of quality is constantly being raised by Ansul research and development.

Send for File No. 633. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

*Factory Mutual Laboratory Reports of Examinations and Tests.

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Butadiene Plant Reactivated

First of the nation's standby petroleum butadiene plants to be reactivated has started production at Houston, Texas, after being in standby for three years. Sinclair Rubber Inc. is operator. The plant has been completely renovated. When operating at proven capacity, the annual production of butadiene will be approximately 75,000 tons.

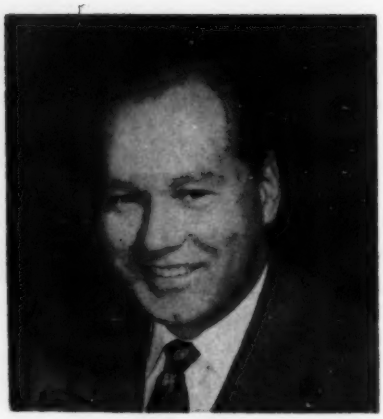
About 50 percent of the 400 employes required for operations are former employes who operated the plant during World War II. Sinclair Rubber Inc. officials responsible for the operation of the plant are J. O'C. Brown, manager, C. W. Hardell, superintendent, and R. C. Woerner, assistant superintendent.

Halliburton Training Course

Coming in from 20 states and Canada, 120 key field representatives of Halliburton Oil Well Cementing Co. began a supervisor training course recently at Duncan, Okla., Halliburton's home office. Conducting the course is D. A. Weaver, Institute of Public Safety of The Pennsylvania State College, State College, Pa. W. I. Kent, Magnolia Petroleum Co.'s safety director, Dallas, participates in the course also. The course emphasizes field and shop safety, better employee and customer relations, modern supervisory practices, and improved efficiency.

Appoints European Representative

Edward Valve, Inc., East Chicago, Ind., has appointed Societe Audco Belge S.A., Brussels, as Edward sales representative in continental Europe. Sales will be under the supervision of Fred O. Spitzer of the Audco Belge sales staff, who will travel Belgium, Denmark, France, Holland, Italy, Luxembourg and Switzerland. Societe Audco Belge is a subsidiary of Audley Engineering Co., Ltd., Newport, Shropshire, England, who is licensed to build and market Nordstrom lubricated plug valves in the British Isles and on the Continent.



Max Campbell

Heads Security Engineering Sales

Max Campbell has been named vice president and general sales manager of the Security Engineering Co., Whittier, Calif. Mr. Campbell has been actively connected with the oil industry and with the sale of oil field equipment since his graduation from Rice Institute in 1938. He received his field training in Texas with the Hughes Tool Co., and has been a member of their sales organization until his appointment to the vice presidency of Security.

Cubatao Refinery

The site for the government's 45,000 barrel refinery at Cubatao, near Santos, Brazil, is being cleared.

New Book

Geophysical Case Histories, Volume 1, 1948. Edited by L. L. Nettleton; published by Society of Exploration Geophysicists; 617 pages.

It is an old saying that hindsight is better than foresight, meaning that things have a habit of turning out differently from what was expected or hoped for. This adage is peculiarly appropriate in the prospecting for oil. Great care may be exercised in locating the site for drilling a wildcat well, but in very few cases does the outcome conform to the inferences that were drawn from the preliminary geophysical and geological surveys.

For this reason the Society of Exploration Geophysicists has undertaken to provide material by which geophysical surveys can be judged by later development, and thus aid in the interpretation and evaluations of other geophysical work. A committee composed of 27 members of the Society have collaborated in assembling a collection of 60 pages, 200 of them new contributions, which show how well or ill the final results confirmed the conclusions drawn from the data collected in the original surveys. The cases are grouped by geological provinces, and at least show the many different courses which the development of a prospect may take. When made use of in this sense the book represents an important aid to oil executives who are called to make the gamble when a wildcat well is drilled.

Boiler Corrosion

Boiler Corrosion and Feed Water Treatment, by H. Hillier, published 1950 by G. & J. Weir Ltd., Glasgow, Scotland; 42 pages, gratis.

This unusual trade publication ably summarizes the fundamental factors of electro-chemical action that cause corrosion inside boiler equipment, which mainly reside in hydrogen ion concentration and in the presence of dissolved oxygen. The means for obtaining immunity from corrosion and also means for conditioning boiler water in all its aspects to prevent formation of scale and soften undesirable phenomena are thoroughly discussed.

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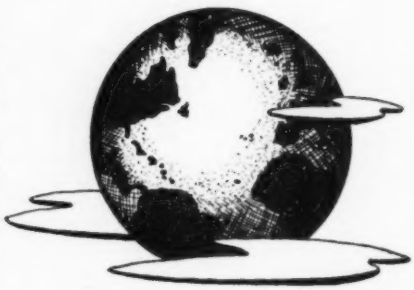

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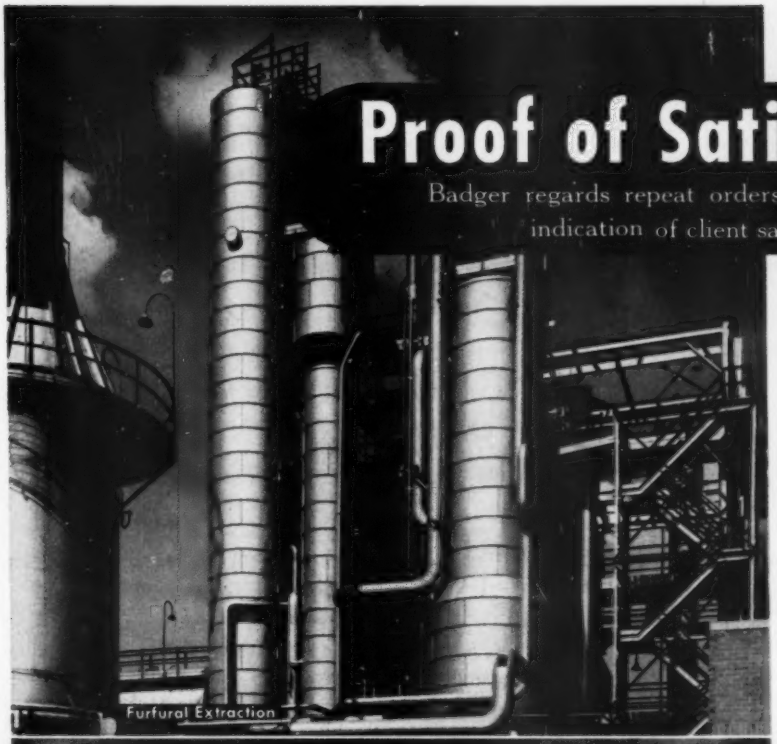
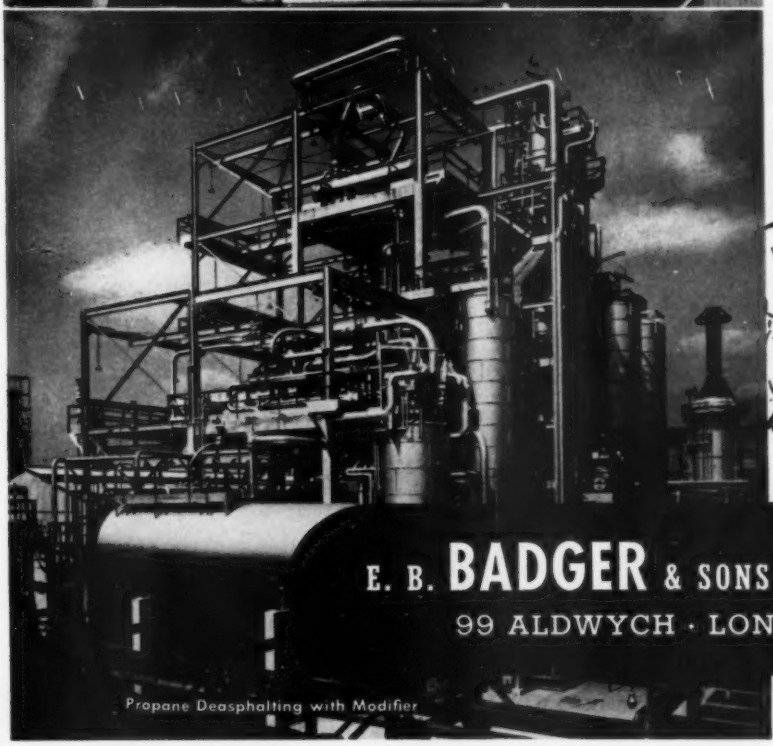


Furfural Extraction



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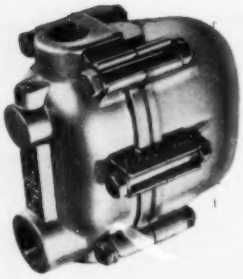
One of the unusual features of this FT-60 series of ball-float steam traps is that the case is a hot brass pressing (cadmium-plated bolts); probably one of the deepest and most difficult hot pressings ever made. But that is only a bit of the story.



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Even more unusual, perhaps, to find that such a firm doesn't after all sell steam traps (like so much hardware) but good steam trapping methods.

And one might feel it is something quite off the beaten track to find that same firm concerning itself almost wholly and solely with methods of improving heat transfer from steam, of which good steam trapping methods are an essential part.

Thus the services to the oil industries from this single source include: (A) advice on any steam-heat transfer problem; (B) condensate drainage equipment (steam traps, pipeline strainers, sight glasses) for every requirement from vacuum up to 275 psi; (C) automatic air venting equipment for steam or water or oil lines and plant; (D) steam separators for individual steam drying at the inlets to steam units; (E) flash steam and condensate recovery equipment (including automatic pumping and lifting from vacuum and low pressure); (F) indicating steam metering equipment for departmental readings.

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CONVERSION OF PETROLEUM—A. N. Sachanen	$11.00
CHEMICAL REFINING OF PETROLEUM — V. Kalichevsky & Stagner	$ 7.00
CHEMICAL ENGINEERS' HANDBOOK—John H. Perry (revised 3rd edition, 1950)	$15.00
CORROSION (Causes and Preventions)—Frank N. Speller	$ 7.00
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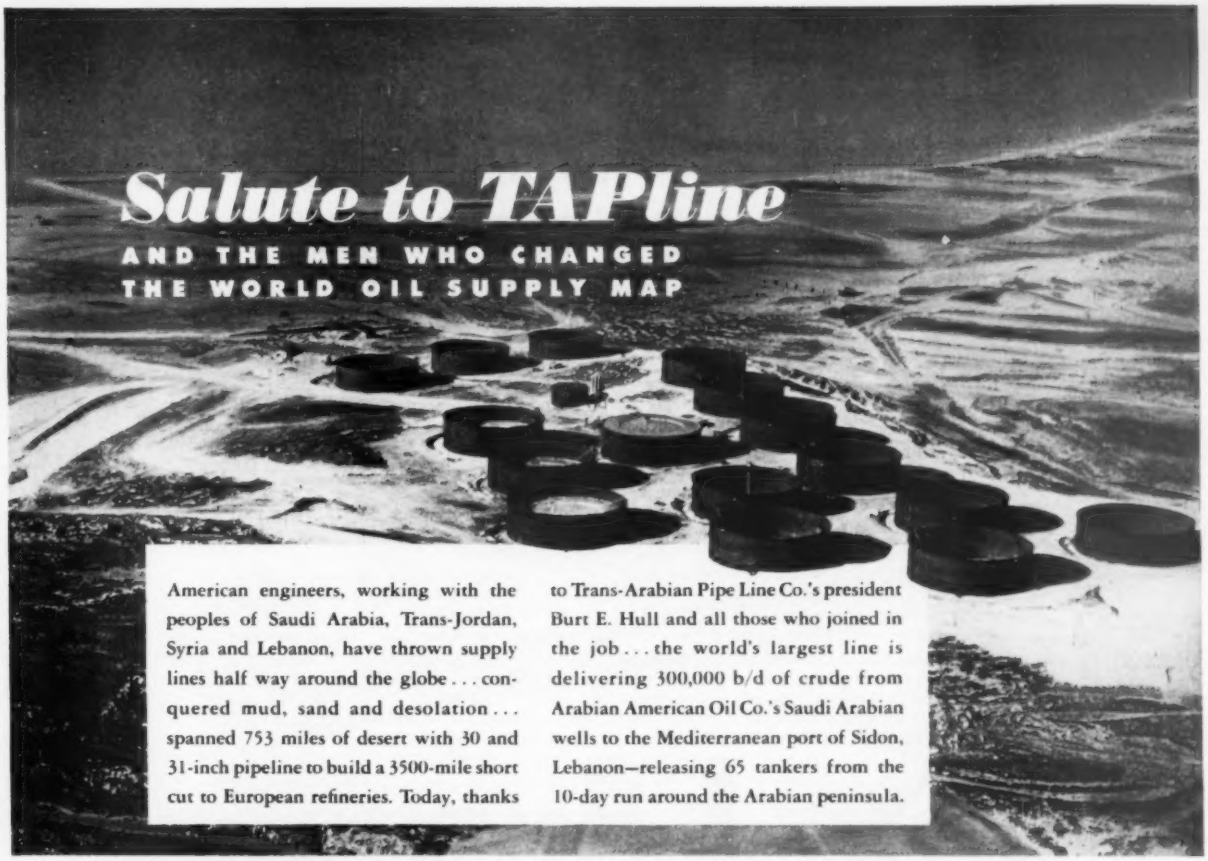
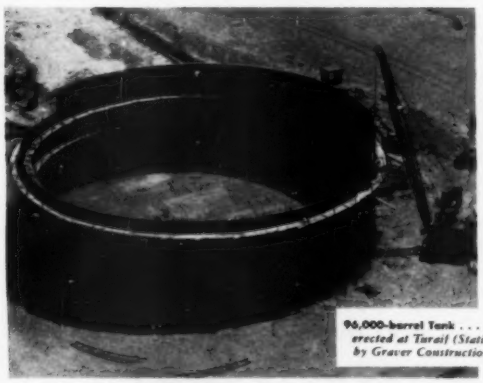


Salute to TAPline

AND THE MEN WHO CHANGED THE WORLD OIL SUPPLY MAP

American engineers, working with the peoples of Saudi Arabia, Trans-Jordan, Syria and Lebanon, have thrown supply lines half way around the globe . . . conquered mud, sand and desolation . . . spanned 753 miles of desert with 30 and 31-inch pipeline to build a 3500-mile short cut to European refineries. Today, thanks to Trans-Arabian Pipe Line Co.'s president Burt E. Hull and all those who joined in the job . . . the world's largest line is delivering 300,000 b/d of crude from Arabian American Oil Co.'s Saudi Arabian wells to the Mediterranean port of Sidon, Lebanon—releasing 65 tankers from the 10-day run around the Arabian peninsula.

Looking Westward to the Mediterranean Sea . . . *at Sidon where Graver Construction Co. erected terminal tankage of nearly three million barrels.*



96,000-barrel Tank . . . *erected at Turaif (Station 6) by Graver Construction Co.*

Pump House at Station 6, Turaif . . . *built by Graver Construction Co.*

What Graver Did to Help Move Arabian Crude Closer to Europe

More than 100 Graver engineers with a host of Graver-trained Arab workmen built the entire facilities for Station 6, Turaif—including the pump house and installation of all machinery, erection of a 96,000-barrel tank, and housing and other accommodations for a complete town of 1,000 people. At the Sidon terminal Graver Construction Co. erected sixteen 180,000-barrel tanks.

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What Happens When 150,000,000 People Say:

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THE STORY OF OIL

COLONEL Edwin Drake's oil well, drilled in 1859, produced only 20 barrels daily . . .

But it gave people a taste of the benefits of petroleum—and a great industry was off to a flying start!

The first drilling rigs—first refining equipment—were adequate for that early demand.

But invention of the automobile, airplane, Diesel engine and other great machines in turn demanded great invention in oil—and old-fashioned equipment gave way to scientific research laboratories, modern refineries, pipelines, tankers and tank cars.

Each year demand made them bigger and better!

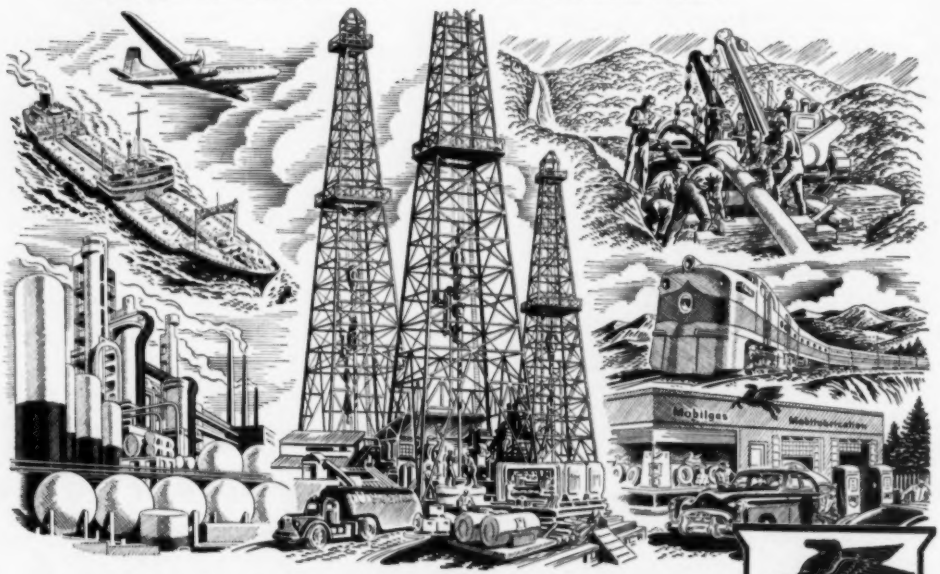
Today, thousands of oil companies with oil fields, refineries, bulk plants, service stations and cost-cutting transportation systems—deliver over 1,840,000,000 barrels of petroleum yearly—meet U.S.A.'s demands for *value in oil.*

And, today, the responsibilities of Socony-Vacuum, one of the oldest companies in the industry, are constantly mounting . . .

Unprecedented demand for petroleum products calls for expansion in every phase of our efficient, coordinated operation . . .

46,400 independent "small" businessmen must be kept *competitive*—supplied with what it takes to provide a *big money's worth* for you—a good living for themselves.

When 150,000,000 Americans say, *"I want,"* it takes businesses of all sizes to deliver!



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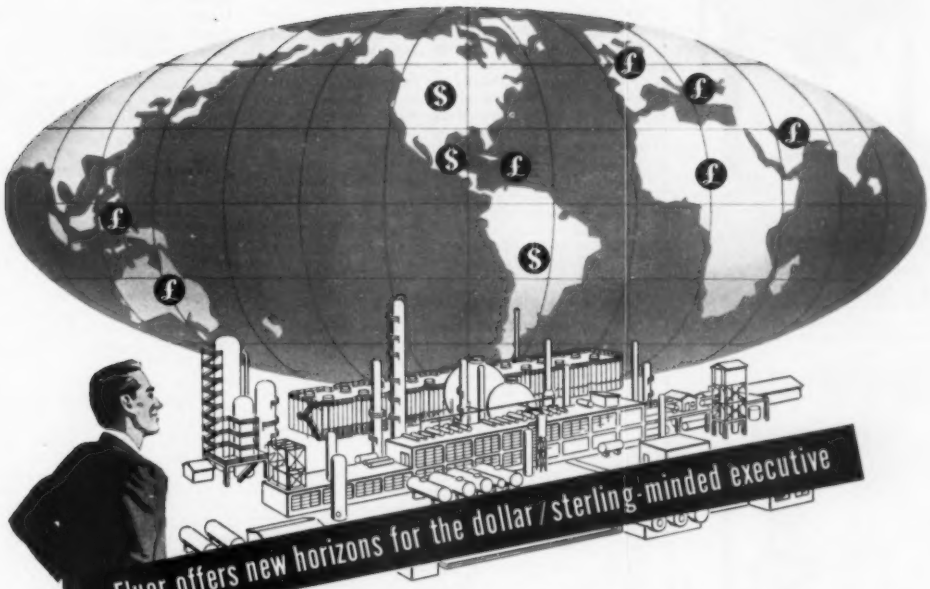

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TO FACILITATE the building of petroleum, chemical and auxiliary plants in the sterling and other areas, The Fluor Corporation, Ltd., takes this opportunity to remind you of its association with Head Wrightsen Processes Ltd., a British Engineering Organization, currently engaged in the engineering, supply and erection of units for Light Oil and Crude Oil Fractionation, Gas Separation, Solvent Extraction, Chemical Treating, Utilities Supply, Carbon Black Production, etc., within the British Commonwealth and other countries.

Unlimited Facilities... The agreement between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd. opens new fields for capital investment in the sterling and other areas by making available . . .

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All Fluor products fabricated by Head Wrightson Process Ltd. will be in strict accordance with Fluor design specifications and will bear the same performance guarantee afforded Fluor products manufactured in the United States. They will be marketed by Head Wrightson Processes Ltd. throughout the sterling area as Fluor products.

A Flexible Agreement... The agreement between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd., is of such flexibility as to offer the investor a free choice in determining the allocation of available currencies between various phases of a project and in arranging the localization of the engineering and fabrication in the best way to meet attendant circumstances. The most advantageous arrangements, varying from case to case, may be determined during the discussions preceding a contract.

Products and Services offered to the investor under the association between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd., are payable in some cases entirely in sterling or, in other cases, largely in sterling with a minimum of dollars involved.

FLUOR

BE SURE WITH FLUOR

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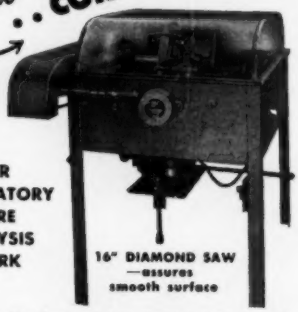

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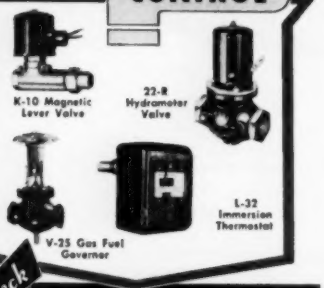

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New Book

Marine Geology, by P. H. Kunen; published 1950 by John Wiley & Sons, Inc., New York: 568 pages; $7.50.

Most if not all geologists direct a large share of their professional attention to components of the earth's crust that once were at the bottom of deep or shallow seas, where accumulation of marine growth and products of erosion have determined the character of the rocky formations that later earth-movements have become accessible to geological study.

In order to understand the nature of these formations the geologist will do well to inform himself of the conditions under which accumulation of sediments goes on under the wide surface of the sea. Oceanography and marine geology in the making have much to do with the oil business. This book, in chapters on sea basins, deep-sea depressions, sources and transportation of marine sediments, coral reefs, geomorphology of the sea floor, and eustatic changes of sea level, will be a valuable addition to any geologist's working library.

New Catalytic Reforming Process

A new catalytic reforming process to improve the octane rating of gasoline was announced this week at an annual meeting of top manufacturing and technical personnel of the Socony-Vacuum Oil Co., Inc. in Los Angeles. Speakers at the meeting reported on several years of research and development work on the new process, including data from a semi-commercial unit operating at a rate of 50 barrels per day. Socony-Vacuum engineers are designing a commercial-size unit. Technical and engineering details of the new process will be announced soon.

Install Cycloversion Units

McBride Refining Co., Inc. completed construction in August of a Perco cycloversion unit at its LaBlanca, Texas refinery. The new processing section has a design capacity of 1,000 barrels per stream day to reform straight run gasoline and full range field distillate.

The Big Sandy, Texas refinery of R. Lacy, Inc. completed a 1,300-barrel Perco cycloversion unit and installed a gas stabilizer and polymerization unit.

C. H. THOMPSON, company counsel for the American Oil Co. since 1926, has been appointed assistant to the vice president in charge of sales. Mr. Thompson established the law department of the company in 1922. He has also participated in sales promotion and general administrative activities.

To Enlarge Lake Charles Plant

Continental Oil Co. has awarded a contract to E. B. Badger and Sons, Boston, for the design and construction of processing equipment which is part of the $10-million construction program that will double the crude oil charging capacity of its Lake Charles, La., refinery. The expansion program, which will increase the refinery crude capacity to 25,000 barrels daily, will include the installation of a thermofor catalytic cracking unit and additional auxiliary equipment for the production of high octane gasoline. The construction program, to be directed by Harold G. Osborn, Continental vice president in charge of manufacturing, is scheduled for completion in the early part of 1952.

To Expand Detergent Production

The Atlantic Refining Co. plans the immediate expansion of its facilities for manufacturing synthetic detergents. Additional manufacturing equipment will be installed in both the Philadelphia refinery and the Port Arthur, Texas, refinery at an estimated cost of between $3 and $4 million. Atlantic is one of the oldest producers of alkyl aryl sulphonates in the United States. The new facilities are planned to increase the output of present products and to manufacture new products.

Named Directors Of Platte Line

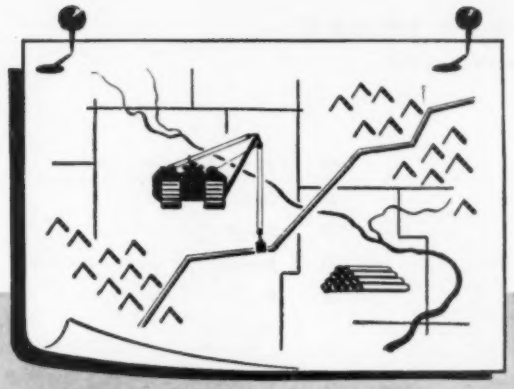
Robert E. Kepke and H. T. O'Neill have been appointed directors of the newly formed Platte Pipe Line Co. Mr. Kepke is vice president of supply and transportation for British American Oil and Mr. O'Neill is the company's vice president of finance. British American and four United States' companies will build the $60-million Platte crude line from Wyoming to Wood River, Ill. Scheduled for completion in late 1951, the new line will enable B-A to increase production in its wholly owned Wyoming Steamboat Butte field which has reserves in excess of 50-million barrels. Aerial maps for 710 miles of the 1,080-mile line have already been completed.

Fatty Oil Fractional Crystallization Process

A new process for separating various components of vegetable, marine and animal oils by chilling the materials in solvent to crystallize out in solid form the desired component has been developed by Texaco Development Corp., it was announced by William P. Gee, vice president. First commercial application will be in a chemical plant now being completed near Chicago, Ill., by Armour & Co.

The National Board of Regents of Nomads held its annual meeting in the California Club, Los Angeles, during the American Petroleum Institute meeting. Those in the picture seated, left to right are: J. C. Basehart, The Buda Co., Dallas-Ft. Worth; H. M. Cosgrove, executive secretary, board of regents, Tulsa; Fred C. Ripley, Jr., International Derrick & Equipment Co., Los Angeles, secretary-treasurer, board of regents.

Standing, left to right: Edmond L. Lorehn, Cameron Iron Works, Houston, alternate for Ed. M. Fontaine; Brad Mills, American Association of Oilwell Drilling Contractors, Dallas-Ft. Worth; Val R. Wittich, Jr., export sales, New York; C. F. Vincent, Byron Jackson Co., Houston, alternate for C. B. McDonald; H. M. Cooley, Bethlehem Steel Co., Tulsa; A. V. Simonson, New York, export sales, alternate for Russell D. Heath.



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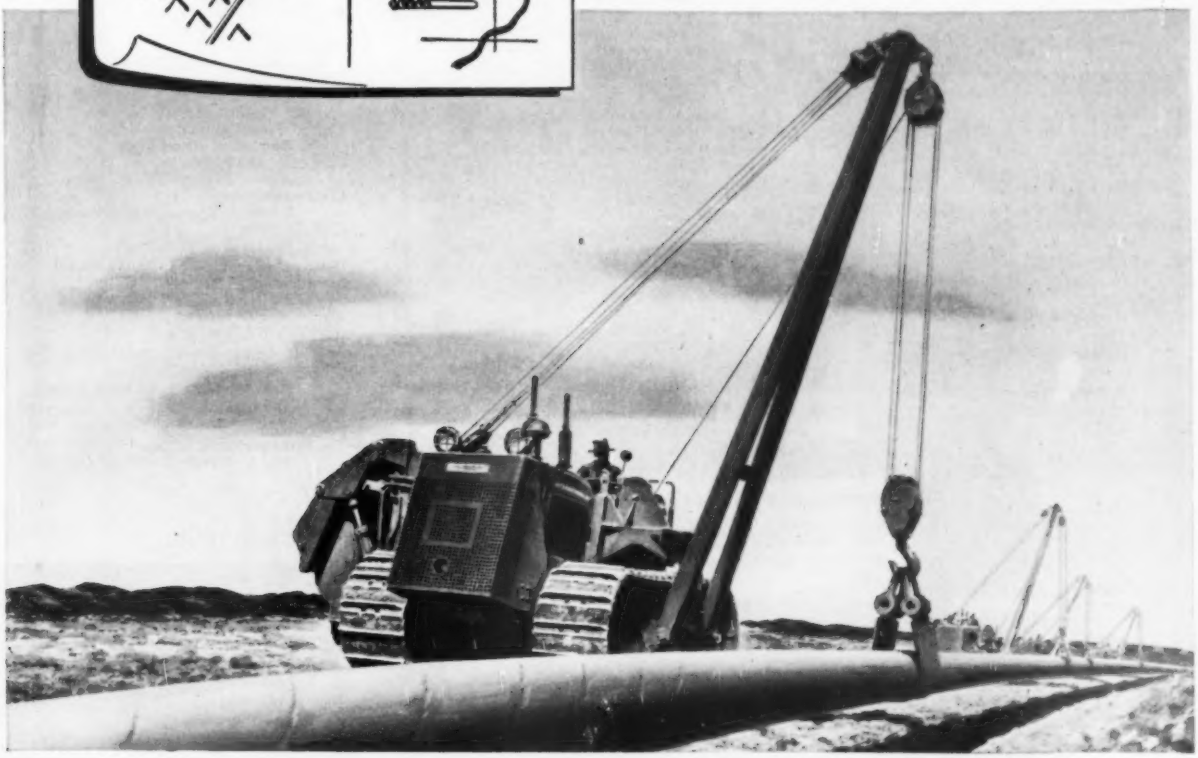
Pipelaying results are better than ever with an International TD-24 Diesel Tractor and the new Superior-Cardwell Pipeboom. Why? Because you work with the unmatched maneuverability of the world's most powerful tractor . . . capitalize on this performance through flexibility and positive control of a pipeboom with 90,000 pounds lifting capacity.



World's most powerful pipelaying team . . .

International TD-24 Diesel plus Superior-Cardwell PBI-24C Pipeboom! No other equipment can match the outstanding performance record of this combination.

The TD-24 with 148 drawbar horsepower has the ability to handle any crawler assignment. And the new Superior-Cardwell Pipeboom turns that ability into absolute top pipelaying performance. You can lay in 34-inch pipe with ease . . . lift 90,000 pounds at a 4-foot overhang, lift 25,000 pounds and stay 14 feet back from the trench. Extendable counterweights, hydraulically-controlled from the tractor seat, make this tremendous capacity possible without extending tractor treads.

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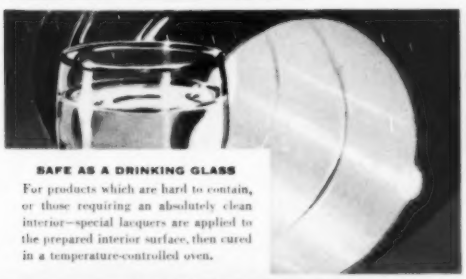

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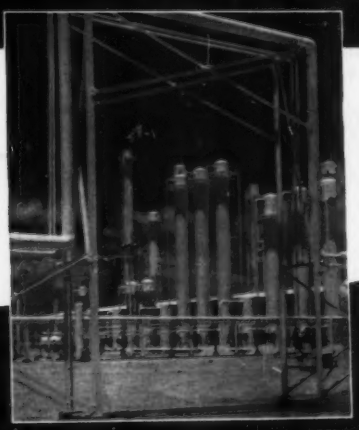
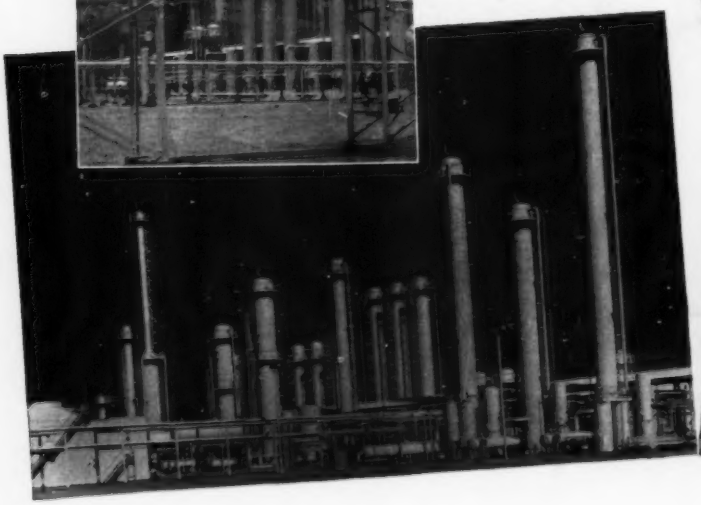
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